Tākaka Freshwater and Land Advisory Group

Recommendations Report

for freshwater management in the
Tākaka Freshwater Management Unit

June 2019

Title photo: Tākaka River (drying reach) from East Tākaka Road.

HE TAURA WHIRI KOTAHI MAI ANO TE KOPUNGA TAI NO I TE PU AU

From the source to the mouth of the river all things are joined together as one

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21 June 2019

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1 Preamble

Thank you for giving us, on behalf of the Tākaka community, the opportunity to lead the work on freshwater management for our area. As members of FLAG, we have each taken seriously the responsibility to our wider community, both present and future generations. Some of us also carry whanaungatanga obligations bestowed on us from those who have gone before.

We have sought to understand freshwater management on all relevant levels – the environmental, the cultural, social and economic, plus the New Zealand legal and policy framework in which we have to operate. When needed, we have engaged professional advice on these matters, including getting a better basis of scientific evidence to consider alongside the many other complex considerations involved in choosing how to manage natural resources.

We have worked to develop approaches that can be implemented to improve how freshwater is managed now, and achieve desired outcomes that sustain all of the values associated with water (wai) into the future.

We are confident that the spectrum of issues and views we have discussed represents the spectrum of views in our community.

In considering all of these matters, we have used a consensus seeking approach, as you requested. Working to consensus means that everyone on FLAG understands why the decision has been reached and is able to live with and support the decision – this is true for the decisions made about process and content that have led to the recommendations, and the recommendations themselves. Achieving this level of understanding and agreement is a time consuming process because of the type and amount of communication required to give fair consideration to all views.

Through dedicated and patient effort, in an environment where participants have built respect-based relationships with each other, we have successfully achieved consensus on the fundamental principles of freshwater management, and most aspects of the package of recommendations. The only exception is the specifics of the water allocation regime in two of the management zones, one of which the outcomes of the Water Conservation Order process (WCO) may influence or determine.

Manawhenua Ki Mohua, as the ahi kā iwi of Mohua/Golden Bay, have provided feedback on our proposed freshwater management package and our values and views align with each other's. We recommend their Manawhenua Mātauranga Report to you for reading in conjunction with our report.

As a Council, you now need to decide on our recommendations.

We urge you to proceed with this work immediately so that the improved management of water quality and quantity can be implemented in the Tākaka catchments.

Given the considered effort that has gone into designing and agreeing this integrated management package, we recommend that you adopt all the core recommendations in full and draft a plan change and implementation plan based on these recommendations.

Or to put it more colloquially – we think we have it about right, please don't mess it up.

Whist we are confident of the recommendations we make, we acknowledge that there is plenty of detail for you to consider from an implementation perspective – particularly in relation to the management of water quality. If you do decide to change or not adopt any part of this management package please seek staff or our advice on any implications.

We would hope that the reconciliation we have achieved across a broad spectrum of views to reach a consensus on recommendations, and the alignment of these with the values and views of Manawhenua ki Mohua, will carry weight in our community and gain their support. Of course, we cannot guarantee that, and given some of the strongly expressed positions we experienced during public consultation with the Golden Bay/Mohua community, we expect that some groups will seek to litigate our work through the RMA Schedule 1 process.

We feel a lengthy and litigious Schedule 1 process would be unfortunate given the sincere work we have done – we hope that interested parties will also read this report and carefully consider how to take a constructive approach, so that we can get timely improvements in freshwater management in the Tākaka catchments.

Finally, this report outlines all of FLAG's recommendations, and supporting background information, to enable Council to implement the NPS-FM for the Tākaka Freshwater Management Unit. The report provides an outline of what we think will be useful to you from what we have learned, considered and decided - we trust the Council staff we have worked with and are confident they will be able to supplement this information if you require. Also, we are happy to have ongoing discussions with you if that will assist your understanding of why we have reached our decisions, to save you 'reinventing the wheel', so to speak, in your own discussions.

Again, thank you for the opportunity to undertake this work for you – we trust that you, on behalf of the Tasman public, will find our report and recommendations well considered and a valuable contribution to freshwater management.

We hereby commend this report to you and handover the continuation of this work.

The Tākaka Freshwater and Land Advisory Group

2 Executive Summary

This report is for the Tasman District Council (Council).

The report is the package of recommendations from the Tākaka Freshwater and Land Advisory Group (FLAG) for management of freshwater in the Tākaka Freshwater Management Unit (Tākaka FMU).

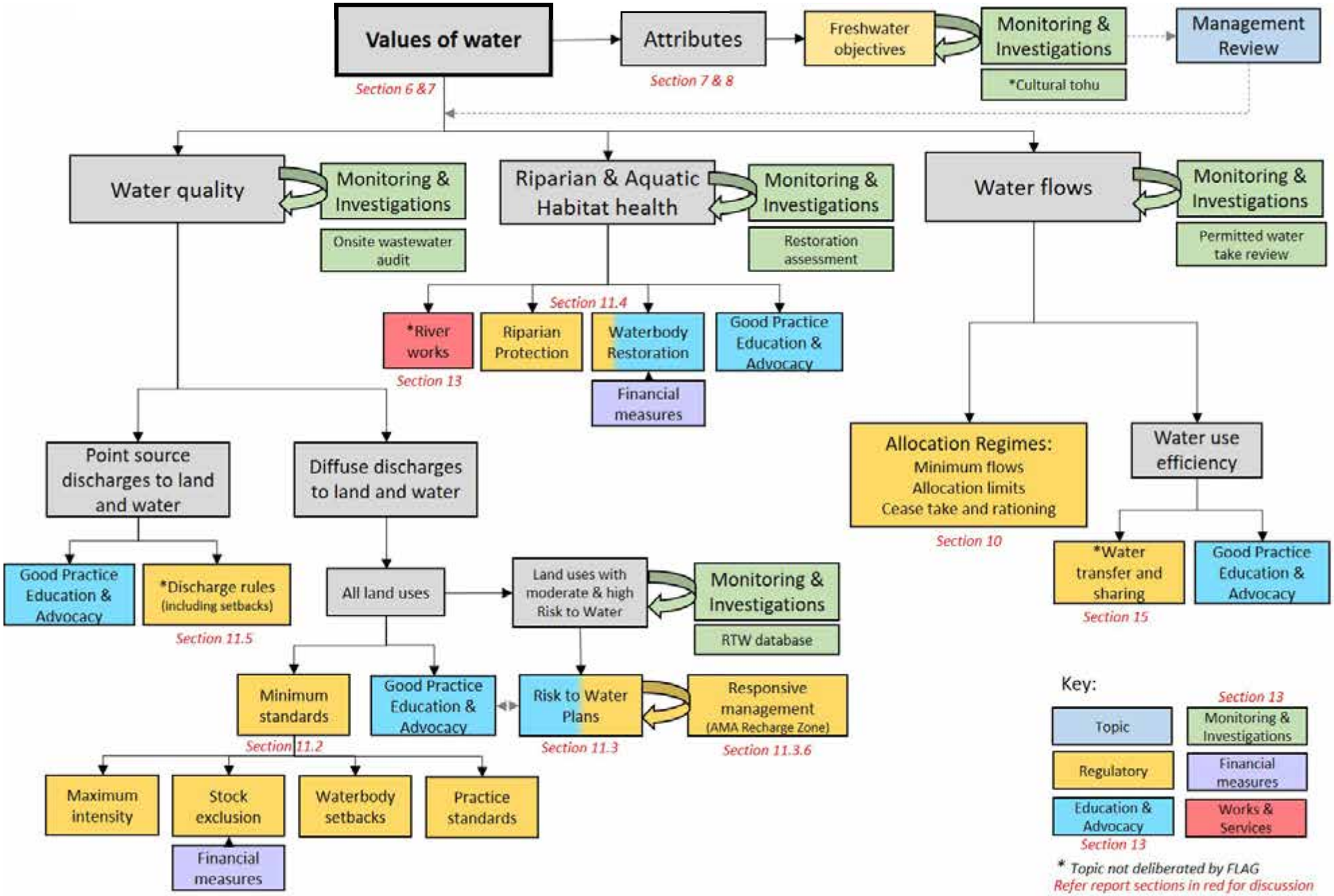
This work is undertaken to meet the requirements of the National Policy Statement for Freshwater 2014 (NPS-FM), which Councils must implement. In line with these requirements you asked us to focus on the management of water quality and quantity, to which our recommendations relate.

Core outcomes of the package of recommendations include:

- The values and management objectives that the management approaches aim to provide for and achieve. The values and management objectives have been the reference point for all of our decision-making. These are also supported by attributes, which are to be monitored to access achievement of freshwater objectives.
- An allocation management framework that sustains the flow dependent values of rivers and aquifers and makes additional water available for extractive use where it is ecologically sustainable to do so. Fundamental to this framework is the use of cease takes to help sustain river and spring flows in times of low flow.
- A water quality framework that focuses on diffuse discharges from land use, which includes new land use rules setting minimum requirements for high risk activities, proposed risk to water planning as part of farm environment plans, and improved riparian management.
- Specific protections for Te Waikoropupū as an Outstanding Freshwater Body and wāhi tapu taonga.
- A package of non-regulatory approaches that are an integral part to the success of the whole management regime.
- The need for a Tākaka Freshwater Plan Change to implement those aspects of the package that require regulation.

The figure below (from Section 9) summarises the management package.

Draft Framework for Freshwater Management in the Tākaka FMU



Values of water

We have identified eight values of water representing the wide range of ways that water is vitally important:

- Cultural and spiritual values
- Ecosystem health
- Municipal and domestic water supply
- Fishing and food gathering
- Livelihood and economic use
- Natural form and character
- Recreation
- Hydro-electric power generation

We have defined these values in Section 6 and identified management objectives for each value, which are supported by Manawhenua ki Mohua. Providing for all the values of water is fundamental to the recommendations and the management frameworks we have identified.

Overall, the approach to allocation and protection of ecosystem health in the Tākaka catchments is intentionally ecosystem based and risk adverse (cautious). This recognises the special nature of the water bodies in the FMU, the complexity in their connections, and the uncertainty this complexity generates for their management.

Water quantity

The recommended allocation framework provides for additional water to be allocated for consumptive use across the Tākaka FMU, in the order of a 35 – 78% increase on current water availability[1]. This allocation is spread across the individual zones in the FMU, depending on the amount of water sustainably available from each catchments' ground and surface water.

The allocation regime in each zone is set and managed based on a scientific methodology that uses Mean Annual Low Flows (MALF) as the limit setting statistic, with minimum flows established and protected by cease takes[2] to avoid abstraction effects on the ecological functioning of rivers when flows are low.

The foundation of the water allocation approach is protecting and sustaining ecological functioning and values, then ensuring that other values that rely on water left in waterbodies are also provided for. Consequently, our decisions are based on expert science advice, with adjustments to recognise and provide for local cultural, social and economic values, which still achieve the desired level of ecological protection.

The allocation regime methodology and zone outcomes are described in Section 10 and allocation limits summarised in Figure 10.

Water quality

Water quality in the Tākaka FMU is mostly very good or exceptional and we want this maintained. Some areas need improvement (see Figure 20 and Appendix 16.7.1 for more detail).

The recommended approach to water quality management seeks to:

- manage contaminants that may enter water, particularly from diffuse discharges from land uses. Core contaminants of concern are:

[1] The difference in allocation amount depends on the decision made for the AMA Recharge Zone, which may be influenced or determined by the outcomes of the Water Conservation Order process for Te Waikoropupū.
[2] and rationing were flow recession allows

    - sediment
    - microbial pathogens (which cause disease)
    - nutrients, particularly nitrates and phosphorus

- improve ecological health of our waterways through protecting riparian vegetation and promoting waterbody restoration, as the 'best value' approach to improving freshwater habitats and associated water quality parameters.

The management of contaminant risk to water from diffuse discharges is achieved by:

- setting minimum bottom line requirements for land use activities and practices that are a high risk to water quality, through new rules in the Tasman Resource Management Plan (see section 11.2)

- Assessing the likely risk to water from particular land uses, and gathering more information and understanding about those risks, and having land-users show they are actively managing the risks to water on their properties (see section 11.3)

- Adding new protections for Te Waikoropupū including:
    - Correlating the level of on-farm monitoring, reporting and management required in areas that recharge the Arthur Marble Aquifer, with the results of freshwater attribute monitoring at Te Waikoropupū main spring
    - Setbacks for specific activities from the Waikoropupū reserve, and an exclusion zone for new bores in close proximity to the springs
    - Prioritisation of the Fish Creek catchment for waterbody restoration

The recommended approach to water quality management is outlined in Section 11, and Section 11.1 provides a succinct overview.

The importance of implementing both the regulatory and non-regulatory aspects

We have learned that whilst the Tasman Resource Management Plan (TRMP) contains many valuable policies and objectives, they remain unrealised because the associated non-regulatory approaches remain unimplemented. In the FLAG recommendations package, the non-regulatory approaches cover aspects that are fundamental to the success of the overall package. These include funding and resourcing support, education and advocacy, monitoring and compliance work, and partnership initiatives for riparian restoration and land management support and liaison.

What will all of this cost?

We appreciate that as Councillors, you may now be thinking – what will this cost?
We have not yet obtained specific economic information and analysis to define the costs of implementation, or fully considered how these costs might be minimised or spread over time. We consider Council is best placed to engage this work, including consideration of the cost of different implement approaches, and how best to achieve affordability for all affected parties.

We have defined 'what' needs to happen, 'when', 'where' and 'why', and offered our insights into 'how' this can be achieved – we now hand this over to Council to make your decisions on our recommendations and develop the implementation - the 'how' - in detail.

Our recommendations are listed in the following table.

2.1 List of FLAG recommendations

The FLAG recommendations are summarised below, and are included at the front of the relevant sections of the report that outline the background, supporting information, and reasons for the recommendation.

FLAG Recommendations	Section References
FLAG recommendation 1: That the Council receive and consider this report and: a) adopt all of the recommendations in this report as the "Tākaka Freshwater FMU recommendations package", which is an integrated package that is intended to operate as a holistic framework (including water quality and quantity elements, and regulatory and non-regulatory methods); and b) if you should choose not to implement the full package of recommendations, please ensure that you seek staff advice on the consequences of those decisions, including the dependency of the recommendations on each other and implications for the consensus achieved by the group.	3.0
FLAG recommendation 2: That the Council instruct staff to: a) progress the development of the Tākaka Freshwater Plan Change and Implementation Plan to provide protections to Tākaka waters, including Te Waikoropupū Springs; and b) advise FLAG of any significant differences between the Tākaka FMU recommendations package and the proposed Tākaka Freshwater Plan Change and Implementation Plan, so that FLAG remain informed on the content of what will be publicly notified; and c) seek FLAG feedback on how the proposed Tākaka Freshwater Plan Change and Implementation Plan aligns with the intent of our recommendations package.	3.0
FLAG recommendation 3: That the Council consider, in conjunction with the FLAG summary report, the Manawhenua Mātauranga Report by Manawhenua ki Mohua (June 2018), as it provides feedback on FLAG's work, and includes topics that were out of FLAG scope, or could not be adequately addressed within the project timeframes.	3.0 Ref: 3.2.2 4.4.3
FLAG recommendation 4: That the Council: a) instruct staff to consider relevant recommendations of the Special Tribunal for the Waikoropupū Water Conservation Order in the Tākaka Freshwater Plan Change, once they are received; and b) once the proposed Tākaka Freshwater Plan Change is finalised, proceed with public notification, irrespective of the remaining Water Conservation Order process, to avoid delay in providing protections to Tākaka waters, including Waikoropupū Springs.	3.2.4 Ref: 7.3
FLAG recommendation 5: That Council, in preparation of the Tākaka Freshwater Plan Change, work with Manawhenua ki Mohua, and other Te Tau Ihu Iwi as appropriate, to define cultural	4.4.3

FLAG Recommendations	Section References
tohu to use within the attribute and freshwater objective framework and associated monitoring and reporting.	
FLAG recommendation 6: That if the Council considers that further public engagement is needed during preparation of the proposed Tākaka Freshwater Plan Change and Implementation Plan, that the Council undertake that consultation, not FLAG.	4.5.1
FLAG recommendation 7: That the Council instruct staff to undertake further industry and stakeholder engagement during preparation of the Tākaka Freshwater Plan Change and Implementation Plan, including on: a) the acceptability of security of supply in each zone to determine if allocation limits need to be reduced to improve security, and b) development of minimum standards for high risk to water activities and practices (refer Section 11.2), and c) development of the Risk to Water framework for land use with moderate to high risk to water (refer Section 11.3), including implementation methods.	4.6.1 Ref: 10.8
FLAG recommendation 8: That: a) the Council adopts the Tākaka Freshwater Management Unit and Zone boundaries as described in Section 5 and set out in Table 2 and Figures 3, 4 and 5; and b) that these zones form the basis for application of any management methods used for water management in the Tākaka Freshwater Management Unit.	5.2
FLAG recommendation 9: That: a) the Council adopts the values of water and the associated management objectives defined by FLAG (as stated in Sections 6.2 to 6.9 of this report), and b) that these values form the basis for any future decisions for water management in the Tākaka Freshwater Management Unit, so that each value is provided for within the environmental limits of the framework.	6.0
FLAG recommendation 10: That: a) the Council acknowledges and adopts Te Waikoropupū as an Outstanding Freshwater Body under the NPS-FM; and b) the Council ensures any decisions on freshwater management that may affect Te Waikoropupū protects the outstanding values of those springs being: i. Strong artesian flow ii. Exceptional water clarity iii. Cultural and spiritual values, including its wai tapu (sacred water) and wāhi tapu (sacred place) status	7.2

FLAG Recommendations	Section References
FLAG recommendation 11: That the Council instruct staff to: a) Complete work on the definition of metrics, statistics and numerical values for the identified attributes of water to define Freshwater Objectives for the Tākaka Freshwater Management Unit; and b) for any Freshwater Objective not currently being met, to define limits and targets to achieve the Freshwater Objectives; and c) to provide the summary of freshwater objectives and any limits and targets to FLAG for feedback.	8.3.1 Ref: 8.4
FLAG Recommendation 12: That (subject to FLAG Recommendations 13 and 14) the Council: a) adopts the methodology and framework for allocation regimes recommended by Cawthron (as outlined in Cawthon Report 2977 January 2017). The regime elements operate as a combined package, and include: i. Minimum flows and levels to protect aquatic ecology ii. Allocation limits to minimise flat-lining at minimum flow and provide for consumptive uses of water iii. Protection of minimum flows with cease take triggers iv. Use of rationing triggers where flow recession allows v. Use of restart triggers to ensure sufficient rainfall has occurred before restart of water takes b) Acknowledge that adopting this methodology and regime means that all elements of it must be retained to maintain the integrity of the approach, and; c) Instructs staff to include the allocation regimes in the Tākaka Freshwater Plan Change.	10.3 Ref: 10.12 16.6.6
FLAG recommendation 13: That the Council adopts the modifications by FLAG, to the Cawthron recommended allocation regimes, in the Pariwhakaoho and Upper Tākaka Mainstem Zones, that incorporate further provision for Cultural and Spiritual, and Livelihood and Economic values of water.	10.9.1 Ref: 10.12
FLAG recommendation 14: For the Anatoki and Arthur Marble Aquifer Recharge zones, where FLAG did not achieve consensus on a final allocation regime, that the Council consider FLAG's preferred options and reasons for the options identified for each zone, and decide on the option to incorporate in the Tākaka Freshwater Plan Change.	10.9.2 Ref: 10.12 16.6.4 16.6.5
FLAG recommendation 15: That the Council adopts, and incorporates in the Tākaka Freshwater Plan Change, the proposed Waikoropupū Exclusion Zone around Te Waikoropupū main spring, to ensure no new bores and no new water takes occur from the Arthur Marble Aquifer within one kilometre of Te Waikoropupū main spring.	10.9.3

FLAG Recommendations	Section References
FLAG recommendation 16: That the Council adopts the proposed Waikoropupū Surface Catchments Zone and: a) Instructs staff to investigate flows in the upper catchment and the permitted takes occurring in the catchment to inform the setting of a suitable allocation limit for the zone; b) Identifies Fish Creek as a priority catchment for waterbody restoration; c) Supports land owners through provision of advice and financial measures to achieve the desired waterbody restoration and water quality goals in Fish Creek in a timely manner.	10.9.4
FLAG recommendation 17: That the Council instruct staff to include reservation for community water supply in the Tākaka Freshwater Plan Change for: a) the Tākaka Township Zone, and b) all other zones equivalent to the existing consented amount for community water supplies.	10.9.5
FLAG recommendation 18: That the Council instruct staff to formalise the Tākaka Waiting List for water in the Tākaka Freshwater Plan Change.	10.9.6
FLAG recommendation 19: That for the 2019 Tākaka water permit renewal process the Council direct staff to: a) ensure that any potential 'on-paper' over allocation identified (including examples in the Tukurua and Anatimo catchments) is addressed; b) consider: i. bona fide review, ii. inclusion of a consent review condition subject to policy directions from notified Tākaka Freshwater Plan Change, iii. use of interim cease takes to protect minimum flows using existing TRMP polices; and c) consider suitable consent conditions to protect low flows in catchments where there is no hydrological flow data to inform an allocation regime and where allocated amounts have been grandfathered.	10.10
FLAG recommendation 20: That the Council adopts a policy in considering new water take applications, of protecting tributaries to the same extent as the main river from which the zone allocation regimes are derived to avoid cumulative effects of water takes on the ecological health of tributaries. For example, in zones with a 90:10 regime, tributaries in the same zone are also protected relative to their own low flows to an equivalent 90:10 level.	10.11.1

FLAG Recommendations	Section References
FLAG recommendation 21: That the Council: a) instructs staff to consider the implications of applying a prohibited activity status to water take applications above allocation limits, during the development of the Tākaka Freshwater Plan Change, and b) If appropriate, include a prohibited status in the plan change to protect the allocation limits identified in each zone. Otherwise retain the non-complying status.	10.11.2
FLAG recommendation 22: That the Council: a) adopt in principle the regulatory management of land use intensification in the Tākaka Freshwater Management Unit; and b) instruct staff to develop new provisions, in discussion with industry and stakeholders, in the Tākaka Freshwater Plan Change that manage land use intensity to avoid very high risk land uses, such as high intensity stocking or cropping and feed-lots in the Tākaka Freshwater Management Unit.	11.2.1
FLAG recommendation 23: That the Council, for the Tākaka Freshwater Management Unit: a) instruct staff to develop new provisions in the Tākaka Freshwater Plan Change that require exclusion of stock from waterbodies and sensitive areas through: i. fencing, or ii. stock-proof natural barrier formed by topography, or iii. Council approved alternative stock exclusion plans including: 1. provision for appropriate timeframes for this to be achieved by landowners 2. consideration of slope, river size, and stock types b) provide advice on suitable setbacks of fencing from waterbodies c) continue financial support of landowners to achieve stock exclusion where projects meet the relevant funding criteria d) consider ways the Council may attract or facilitate external funding assistance for stock exclusion.	11.2.2
FLAG recommendation 24: That the Council, for the Tākaka Freshwater Management Unit: a) instruct staff to develop new provisions in the Tākaka Freshwater Plan Change that manage waterbody and sensitive area setbacks for: i. High risk activities and practices; and ii. New infrastructure that can potentially generate contaminant discharges, to ensure there is sufficient distance for filtration or interception of contaminant discharges should they occur.	11.2.3

FLAG Recommendations	Section References
FLAG recommendation 25: That the Council, instruct staff to: a) investigate classification of karst sinkholes based on the likely risk to groundwater quality from contaminated runoff, to provide a pragmatic basis for their management, and b) incorporate appropriate management of sinkholes in the Tākaka Freshwater Plan Change, to avoid contaminated runoff entering sinkholes.	11.2.3.1 Ref: 11.5
FLAG recommendation 26: That the Council, for the Waikoropupū Surface Catchments Zone, instruct staff to develop new provisions in the Tākaka Freshwater Plan Change that: a) require setbacks from Te Waikoropupū reserve for: i. High risk activities and practices; and ii. New infrastructure that can potentially generate contaminant discharges, to ensure there is sufficient distance for filtration or interception of contaminant discharges should they occur; and b) includes consistent reference to Te Waikoropupū reserve setbacks within the discharge rules to manage risks from contaminated runoff.	11.2.3.2 Ref: 11.5
FLAG recommendation 27: That the Council instruct staff to: a) engage with industry and stakeholders to identify high risk practices with agreed industry good practice methods; and b) develop new provisions in the Tākaka Freshwater Plan Change that require those practices to be undertaken using the agreed industry good practice method.	11.2.4
FLAG recommendation 28: That the Council, for the Tākaka Freshwater Management Unit: a) adopt in principle the aims of the Risk to Water framework and the aims for any implementation approach as outlined in Section 11.3.1 (1-6 and A-C); and b) instruct staff to identify land uses considered to have moderate or high risk to water in the Tākaka Freshwater Management Unit, for confirmation by Council in discussion with iwi and stakeholders as needed; and c) instruct staff to progress work to define the most appropriate implementation method for: i. ensuring that everyone undertaking land uses with moderate to high risk to water show that they are operating at good practice and managing on-farm risks to water, including management of diffuse discharges, and meeting the minimum standards outlined in Section 11.2; ii. ensuring monitoring, audit and compliance of good practice implementation; and **iii.** ensuring responsive management in the Arthur Marble Aquifer Recharge Zone to increase regulatory controls, if any freshwater objectives are not met at Te Waikoropupū main spring.	11.3 Ref: 11.3.6

FLAG Recommendations	Section References
FLAG recommendation 29: That the Council: a) resolve to develop, and implement, a non-regulatory program to support and encourage riparian and aquatic habitat restoration in the Tākaka Freshwater Management Unit (FMU), including consideration of ways that Council may facilitate riparian and aquatic habitat restoration at a FMU scale; and b) instruct staff to develop new provisions in the Tākaka Freshwater Plan Change that: i. further protect riparian vegetation from removal or degradation, including protection of restoration plantings; and ii. require waterbody restoration plans to be implemented by 2050 to support the non-regulatory program for riparian and aquatic habitat restoration.	11.4
FLAG Recommendation 30: That the Council resolve to: a) include the following topics: 1. Further enabling and promotion of the use of non-consumptive takes, 2. Further enabling and promotion of the use of off-stream storage, 3. Review of the need for water take thresholds for permitted takes to protect small rivers, as outlined in Section 12, in either: i. The Tasman-wide freshwater plan change, as identified in the Council's 2018 Progressive Implementation Plan, or ii. the Tākaka Freshwater Plan Change.	12.0
FLAG Recommendation 31: That the Council instruct staff to develop a Tākaka Freshwater Implementation Plan for non-regulatory methods in the Tākaka Freshwater Management Unit (FMU) that includes: a) Development of recording and accounting systems, including: i. systems required under the NPS-FM for monitoring of freshwater objectives and primary contact suitability ii. systems to record and manage Risk to Water plans and auditing b) Investigation and Monitoring: i. continued investigation of ways to improve water quality at identified locations where desired water quality standards are not being met ii. revision of Council monitoring programs to include relevant new freshwater attributes and sites to enable assessment against the freshwater objectives and provision for the values of water including: 1. Continued SOE monitoring of water flow and quality at Te Waikoropupū main spring, with additional monitoring of water clarity and dissolved oxygen	13.1

FLAG Recommendations	Section References
2. Continued monitoring of flow and water quality at Lindsay's Bridge as a reference site for surface water quality influencing the Arthur Marble Aquifer iii. audit of onsite wastewater systems to understand the risk posed to water and to inform compliance and education and advocacy efforts iv. investigation of riparian and aquatic habitat state in the FMU, and waterbody restoration needs, to better understand the scale of restoration required for improved water quality, ecosystem processes and biodiversity to provide for Ecosystem Health v. investigation of the potential effects of permitted takes on small rivers vi. progressing work with manawhenua iwi to define cultural tohu (indicators) for use in setting freshwater objectives and State of the Environment monitoring to provide for cultural and spiritual values c) Education, Advocacy and Behavioural Change: i. Provision of additional resourcing (including staff) for education and advisory capacity within Council to work with iwi, local land owners, community and industry groups in the Tākaka FMU to promote, facilitate and encourage: 1. Use and sharing of industry good management practice within and between industries for: • management of point and diffuse discharges to land and water • water use efficiency 2. Waterbody restoration, including riparian vegetation and aquatic habitats 3. Appropriate design, operation and ongoing maintenance of on-site wastewater systems d) Works and Services: i. Progress of work for: 1. the Tākaka Urban Stormwater Catchment Management Plan in discussion with iwi and the community, including consideration for methods to improve the water flows, quality and ecological health of the Te Kakau and Motupipi Rivers 2. investigation and implementation of approaches to improve water health in Lake Killarney ii. Review Council's approaches to river channel management methods (including stabilisation, gravel management, flood control and herbicide/pesticide use) to ensure they achieve positive outcomes for Ecosystem Health and other values of water, in addition to erosion, flooding, gravel and pest management outcomes e) Financial Measures: i. Continue to provide financial subsidy (fencing fund) to support landowners to fence waterbodies for stock exclusion	

FLAG Recommendations	Section References
ii. Continue to provide financial subsidy (catchment fund) to support and facilitate landowners and the community to undertake waterbody restoration iii. Consider ways that the Council could help support landowners and the community to attract and efficiently use external funding to further waterbody restoration and stock exclusion efforts in the Tākaka FMU f) Further Regulation Review: i. Regional review of water takes and discharges (as specified in Section 12) ii. Reviewing the resourcing and efficacy of compliance and enforcement efforts for management of water flows and quality	
FLAG recommendation 32: That the Council instruct staff to commission an economic analysis that considers the implementation approaches and costs of the proposed Tākaka FMU recommendations package, including consideration of: a) The regulatory and non-regulatory aspects, b) Enabling the Tākaka community to provide for its economic well-being, including productive economic opportunities as required under the NPS-FM (Objectives A4 and B5) c) The economic value gained or lost to the Tākaka FMU, Golden Bay/Mohua, Tasman region, and New Zealand communities, including the provision for, and protection of, values through: i. water left in waterbodies (in situ), and ii. water provided for consumptive use d) How best to manage any financial cost implications of the regulatory and non-regulatory approaches, including identification of: e) The costs to Council of fully implementing the new freshwater management regime, including consideration of the options available to meet those costs and co-ordinated financial planning across Council, so that the desired outcomes from the FLAG recommendations (in meeting the NPS-FM) are realised. f) Direct financial costs and benefits to individuals or sectors of the community. In recognising where those costs and benefits fall, presenting recommended approaches to ease the burden of costs, or require reciprocity for benefits, where it is fair to do so.	14.0
FLAG recommendation 33: That the Council consider the following issues, and report back to the FLAG and the Tasman community on the outcomes of their consideration, and any resolutions regarding work to address these: a) Promoting rainwater harvesting, where this will not impact housing affordability b) Reviewing the effects and management of native tree removal as a result of irrigation or intensification of land use	15.1

FLAG Recommendations	Section References
c) Reviewing the controlled activity status of water renewals (as creating a perpetual right) d) Investigating options for promoting and implementing utu (reciprocity) for water resource use, so that the benefits received from water use are reciprocated back to local waterbody environments and communities e) Investigating improvements to the water transfer system to improve and promote water use efficiency f) Undertaking more reporting back to the community to improve understanding of water resources and their management, to establish greater trust in the work of Council g) Investigating methods to address concerns around the regulation of specific end uses of water to manage potential effects on water quality, and the 'best use of water' for meeting the community's well-beings h) Investigating methods to address concerns around offshore or out of region use of local water, with little or no benefit to local communities i) The options for Council to help improve the management of whitebait j) Safe public access to waterbodies.	
FLAG Recommendation 34: That the Council consider the lessons learnt from the Tākaka FLAG process, from FLAG members, iwi, staff, the independent facilitator and survey work by Landcare Research , in the development and implementation of any future collaborative community processes, with the aim of improving staff resourcing, reducing project timeframes, and improving the processes around public, stakeholder and iwi engagement.	15.2

Part 1: Introduction and FLAG process

3 Introduction

This report summarises the recommendations of the Tākaka Freshwater and Land Advisory Group (FLAG)[3] for management of freshwater in the Tākaka Freshwater Management Unit (FMU). It includes key background information, outlines our philosophy in managing freshwater, and defines the recommended framework for managing water quantity and quality.

Council set us the task of finding a consensus view on freshwater management in the Tākaka FMU. This has been a worthwhile, but challenging and complex undertaking. The views expressed in this report are consensus views (unless otherwise stated). There are many elements that we spent considerable time debating, which reflects the wide range of viewpoints held across the group.

While a consensus position is achieved for almost all aspects of the framework and recommendations, there are different levels of comfort for each of us with each of the consensus positions reached. Members may have sought or provided compromise across different parts of the framework, in order to reach the consensus position. As such, the proposed management framework as a whole represents the ultimate consensus reached, which the whole group can live with and support, even though there are parts of it that we may individually support more fully and are more comfortable with than other parts. Cherry picking parts of the framework to keep and dismissing other parts, based on a majority vote approach, or one set of dominant values, will undermine the whole, which is intended to operate as an integrated package.

We expect Council to utilise this report and the recommendations to inform development of a plan change for improving freshwater management in the Tākaka FMU, and an accompanying implementation plan to ensure non-regulatory methods are defined and funded through the Long Term Plan.

FLAG recommendation 1:

That the Council receive and consider this report and:

a) adopt all of the recommendations in this report as the "Tākaka Freshwater FMU recommendations package", which is an integrated package that is intended to operate as a holistic framework (including water quality and quantity elements, and regulatory and non-regulatory methods); and
b) if you should choose not to implement the full package of recommendations, please ensure that you seek staff advice on the consequences of those decisions, including the dependency of the recommendations on each other and implications for the consensus achieved by the group.

FLAG recommendation 2:

That the Council instruct staff to:

a) progress the development of the Tākaka Freshwater Plan Change and Implementation Plan to provide protections to Tākaka waters, including Te Waikoropupū Springs; and
b) advise FLAG of any significant differences between the Tākaka FMU recommendations package and the proposed Tākaka Freshwater Plan Change and Implementation Plan, so that FLAG remain informed on the content of what will be publicly notified; and
c) seek FLAG feedback on how the proposed Tākaka Freshwater Plan Change and Implementation Plan aligns with the intent of our recommendations package.

[3] Throughout the report we have used 'FLAG', 'we' and 'us' in reference to FLAG views, and 'you' and 'your' in referring to the Council and councillors for whom this report is written.

In addition to this report from FLAG, the Council will be formally receiving a report from Manawhenua ki Mohua (MKM), which the Council commissioned on behalf of FLAG. Feedback provided by MKM in their Manawhenua Mātauranga report (MKM 2018), including feedback on specific elements of the recommendations, has been included in the relevant sections of this report. Other aspects of the Manawhenua Mātauranga Report are out of the FLAG scope and need to be considered separately by Council.

FLAG recommendation 3:
That the Council consider, in conjunction with the FLAG summary report, the Manawhenua Mātauranga Report by Manawhenua ki Mohua (June 2018), as it provides feedback on FLAG's work, and includes topics that were out of FLAG scope, or could not be adequately addressed within the project timeframes.

3.1 Fundamental aims of FLAG and the recommendations package

Healthy water is vital for all parts of our lives.

The fundamental aims of the recommendations package are:

- To improve freshwater management in the Tākaka FMU to ensure existing good water quality and health is maintained, or improved where needed;
- To meet the requirements of the National Policy Statement for Freshwater Management (NPS-FM), including the consideration and recognition of Te Mana O Te Wai, by considering the health of water first, and seeking to ensure that water and land use does not adversely impact on water quality, flows and habitat to protect Ecological Health, and other values and uses of water;
- To provide for water use by individuals and the Tākaka community to enable them to provide for their economic, cultural and social wellbeing, through the allocation of water where it is sustainably available;
- To promote good practice, behaviour change and innovation, seeking protection and enhancement of ecosystem and water body health in the Tākaka catchments.

In achieving these aims, the recommendation package seeks to:

- Be effective at protecting the ecological bottom line, avoiding over-allocation and contamination of our waterbodies;
- Enable uses of water and land that enable the local community to provide for its well-being;
- Be equitable, matching risks with regulation requirements, so that we avoid over regulation, but provide sufficient control of activities with a risk to water;
- Avoid duplication of effort, and target compliance and enforcement effort towards those generating adverse effects;
- Providing clarity and certainty to resource users and the community;
- Be flexible and adaptable – enabling change over time as risks and effects may change.
- Recognise the importance of Te Waikoropupū to local iwi and the community and seek to protect it as an Outstanding Freshwater Body.

3.2 Background

The Tasman District Council (Council) set up the Tākaka FLAG in early 2014 to help the Council develop ways to manage fresh water resources in the Tākaka catchments and meet the obligations of the National Policy Statement for Freshwater Management (NPS-FM).

The purpose[4] of the group and process was to:

- facilitate community involvement in the review of water and land management provisions in the TRMP;
- contribute to the establishment of management frameworks and objectives, limits and allocation regimes for freshwater quality and quantity on a local scale, ensuring this framework accounts for:
    - freshwater integration with objectives for coastal environments
    - effects of land use activities.

This report summarises outputs from the process undertaken by the Tākaka FLAG between July 2014 and June 2019 to reach consensus decisions on recommendations for management of freshwater quantity, quality and waterbody health in the Tākaka FMU, which includes all catchments from Wainui Bay to Tukurua (refer Section 5).

3.2.1 Who are FLAG?

The FLAG consists of twelve members who represent a wide range of values and views from across the local community. Most live locally and were selected by Council because they cover the geographic spread across the catchment and a broad spectrum of values, knowledge and experience of water body uses, alongside the ability to work in a collaborative, consensus-seeking manner. The current members are:

- Chris Hill[5]
- Graham Ball
- Greg Anderson
- Kirsty Joynt
- Margie Little[5]
- Martine Bouillir[6]
- Matt (Hika) Rountree
- Mik Symmons
- Mike Newman
- Mirka Langford
- Piers MacLaren
- Tony Reilly

Past members, Neil Murray and Andrew Yuill, are also acknowledged for their contributions to the FLAG process.

Under the group's Terms of Reference, each member is on the group as an individual, rather than as sector representatives. All members wear multiple hats regarding the values and uses of water. For example, a single member might use water in their livelihood, also enjoy swimming or fishing, be involved with conservation efforts, and use groundwater as their home water supply.

Further information on the group terms of reference, the members, and the nomination and selection process is available online at www.tasman.govt.nz/link/Tākaka-FLAG.

[4] Summarized from the FLAG Terms of Reference 2013.

[5] Selected by Manawhenua ki Mohua

[6] Martine Bouillir was originally appointed as the Council representative, but during the FLAG process she retired from Council (did not seek re-election). FLAG chose for her to stay as a member of the group after she left Council. Following her election, Councillor Sue Brown attended many of the FLAG meetings in a non-decision making capacity.

3.2.2 Engagement with iwi

Our relationship with local iwi has grown over this process, beginning with a single member on the group, to hui with further members of the hau kaingā (whanau who live in Mohua), and commissioning by Council of Manawhenua ki Mohua (MKM)[7] to provide a report on their freshwater perspectives and specific review of FLAG outcomes.

MKM have been supportive of the work done by FLAG, and we have found ourselves largely in agreement around our desired outcomes for freshwater management in the FMU and how this can be achieved at this point in time. We have highlighted MKM's perspectives, and views on our recommendations, in the relevant sections of this report. We are presenting this FLAG report to you with the expectation that you will read it in conjunction with MKM's Manawhenua Mātauranga Report (MKM, 2018 - refer FLAG recommendation 3) – combined, these reports provide for a richer, bi-culturally informed consideration of freshwater management.

Further discussion of our engagement with MKM is included in Section 4.4.

3.2.3 Role of Council staff and consultants

We have sought to understand our freshwater resources and options for its future management, including the boundaries of that management from a science and planning context. In order to do this we have sought information and advice.

The role of Council staff has been to provide that advice, across:

- Hydrology – Joseph Thomas: all freshwater quantity management matters and reviewed all science advice received
- Ecology – Trevor James: water quality management, ecological health and freshwater habitats, estuaries and freshwater wetlands, and monitoring
- Soils – Andrew Burton[8]
- Policy and planning – Lisa McGlinchey, Mary-Anne Baker[12], Steve Markham[12]

Council also commissioned additional advice and input on behalf of FLAG on:

- Freshwater ecology and limit setting – Dr Roger Young (Group Manager Freshwater, Cawthron Institute)
- Mātauranga Māori and feedback from ahi kā iwi on our proposed recommendations – Manawhenua Ki Mohua staff and members.

Council also provided:

- administrative and project management support - Mary-Anne Baker[12] and Lisa McGlinchey
- an independent facilitator - Rochelle Selby-Neal
- staff time (Joseph Thomas) in support of the science panel work on Te Waikoropupū[9]

Other advice was also received from:

[7] Manawhenua Ki Mohua (MKM) is the umbrella entity for the three manawhenua iwi living in Mohua; Ngāti Tama, Ngāti Rārua and Te Ātiawa. MKM are the descendants of Māori chiefs, whom through raupatu (conquest) and intermarriage assumed the role of kaitiaki, or guardians of the rohe (area); a responsibility which was subsequently passed down by way of whakapapa (genealogy). As the kaitiaki, MKM continue to carry out their obligations to uphold the cultural and environmental integrity of the rohe for past, present and future generations.

[8] This staff member has since left Council.

[9] Refer Cawthron (March 2017)

- Julian Weir (Aqualinc) and Andrew Fenemor (Landcare Research) on modelling of the Tākaka catchments, funded by the MBIE Wheel of Water Research project[10]. Andrew Fenemor also attended most FLAG meetings as an independent observer as part of this research project.

3.2.4 Te Waikoropupū Water Conservation Order

An application for a Water Conservation Order (WCO) for Te Waikoropupū springs and the Arthur Marble Aquifer was first lodged in December 2013, and a revised application by Ngāti Tama Ki Te Waipounamu Trust and Andrew Yuill was accepted by the Minister of the Environment in June 2017. The scope of the application and subsequent hearing by a Special Tribunal in April-May of 2018 focused on the springs, and the catchment and waterbodies recharging the Arthur Marble Aquifer.

The Special Tribunal has not yet released its report and recommendations. The Council should take into consideration the Tribunal's recommendations when making decisions on progression of the Tākaka Freshwater Plan Change. However, we highlight that the recommendations package includes water management elements that are beyond the scope of the Water Conservation Order, both in terms of where it will apply and what it can influence (refer Section **Error! Reference source not found.**). In addition, the recommendations package includes elements intended to provide protection to Te Waikoropupū flows and quality, which we want put in place whilst the WCO process is completed.

FLAG recommendation 4:
That the Council:

a) instruct staff to consider relevant recommendations of the Special Tribunal for the Waikoropupū Water Conservation Order in the Tākaka Freshwater Plan Change, once they are received; and
b) once the proposed Tākaka Freshwater Plan Change is finalised, proceed with public notification, irrespective of the remaining Water Conservation Order process, to avoid delay in providing protections to Tākaka waters, including Waikoropupū Springs.

3.3 Recommendations package content

The recommendations outlined in this report form an integrated package. Each part is required to meet the freshwater objectives and to support the values of water identified in the Tākaka FMU. The recommendations package includes consideration of water quantity management, water quality management, and water body health, including riparian and aquatic habitat, and connectivity with other waterbodies.

The recommendations package includes:

1. **A framework for the sustainable allocation of water**, including protections of minimum flows and flow variability
2. **A framework for managing the risks to water**, including diffuse discharges from land use

We recommend that these elements be implemented through both regulatory and non-regulatory methods, with:

1. **A plan change** to amend the Tasman Resource Management Plan (TRMP), including:
    a. New objectives and policies to support implementation of the new management provisions in the Tākaka FMU

[10] Refer Aqualinc, 2017

b. New rules and rule sets applicable in the Tākaka FMU

2. **An Implementation Plan** - outlining the non-regulatory methods recommended in six areas:
    a. Accounting and recording systems
    b. Investigations and monitoring
    c. Advocacy and education
    d. Works and services
    e. Financial measures
    f. Future regulatory review

These methods are outlined in sections 9 to 13.

3.3.1 What the recommendations package doesn't cover

Several key topics that we discussed were decided to be either, out of scope of the FLAG work or timeframe, or better deferred to a future regional-focused plan review process.

These topics are listed below and briefly outlined in Section 12 (future plan review topics) and Section 15 (additional considerations).

- **Future region-wide plan review topics:**
    - Enabling and promoting the use of non-consumptive takes, especially for hydro-electric power generation
    - Enabling and promoting the use of off-stream storage[11] for improving water security and drought resilience
    - Reviewing the need for water take thresholds for permitted takes to protect small rivers
    - Reviewing the discharge rules to further address risk to water quality

- **Additional aspects for consideration by Council:**
    - Promoting rainwater harvesting, where this will not impact housing affordability
    - Reviewing the effects and management of native tree removal as a result of irrigation or intensification of land use
    - Reviewing the controlled activity status of water renewals (as creating a perpetual right)
    - Investigating options for promoting and implementing utu (reciprocity) for water resource use, so that the benefits received from water use are reciprocated back to local waterbody environments and communities
    - Investigating improvements to the water transfer system to improve and promote water use efficiency
    - Undertaking more reporting back to the community to improve understanding of water resources and their management, to establish greater trust in the work of Council

[11] *Off-stream storage is based on land and is not located in the bed of a river, for example dams in ephemeral gullies that harvest rainfall runoff. Such storage can be filled by takes from waterbodies, but does not have the added potential for effects on the functioning of the rivers by being located within them (unlike on-stream storage).*

- Investigating methods to address concerns around the regulation of specific end uses of water regarding the potential for subsequent generation and discharge of contaminants
- Investigating methods to address concerns around offshore or out of region use of local water, with little or no benefit to local communities;
- The options for Council to help improve the management of whitebait;
- Safe public access to waterbodies.

In addition, our recommendations focus primarily on water quantity management for use, and water quality management in line with the NPS-FM. As such, a number of other water related management topics have not been considered in the FLAG process, for example gravel management, flood management, including river channel modification, and activities on the surface of rivers. Council staff advise that further work on these aspects will be undertaken through the upcoming review of the freshwater parts of the TRMP[12].

4 FLAG Process

4.1 National Policy Statement for Freshwater Management

The National Policy Statement for Freshwater Management (NPS-FM) is a key driver behind the Tākaka FLAG process. The Council is obligated to fully implement the NPS-FM by 2030 at the latest.

The NPS-FM includes objectives and policies for the management of water quantity and quality and identifies 13 national values, with Ecosystem Health and Human Health for Recreation as compulsory national values for all water bodies.

The process undertaken by the Tākaka FLAG sought to meet the requirements of the NPS-FM 2014 (and subsequent amendments in 2017) - specifically the national objectives framework set out in objective CA1 and policies CA1 and CA2, summarised as:

1. Defining the **Freshwater Management Unit** (FMU)
2. Identifying the **values of water** in the FMU
3. Identifying **relevant attributes** for the values and uses
4. Assigning an **attribute state** to each attribute
5. Formulating **freshwater objectives** (numeric or narrative)
6. Identifying **methods to maintain and improve freshwater** so:
    a. freshwater is suitable for primary contact more often
    b. the community (including individuals) is enabled to provide for their economic well-being, including economic opportunities (within limits)
    c. freshwater objectives are met, and values and uses are provided for, while first providing for water health

The outcomes of steps 1 and 2 are described in sections 5 and 6. The outcomes for steps 3, 4 and 5 are discussed in Section 8. Step 6 includes both regulatory and non-regulatory methods identified within the recommendations package discussed in Sections 9 to 13.

[12] Parts 5 (water take and use), and Part 6 (discharges) of the TRMP reach their 10 year review date in 2021, Part 4 (river and lake beds) in 2024.

4.2 Tākaka FLAG process – collaborative and consensus seeking

The Terms of Reference for the Tākaka FLAG directed members of the group to work in a collaborative and co-operative manner using best endeavours to reach solutions that take account of the interests of all sectors of the community. FLAG was also directed to seek consensus in its decision-making where at all possible, utilising an external facilitator as necessary, to assist group discussions and deliberations.

We decided that in the event of non-consensus on a topic, rather than recommending the majority view, we would put to you the preferred options within FLAG for your decision. For most of the recommendations package elements, the FLAG reached consensus. Areas of non-consensus and the associated preferred options and reasons are outlined in Section 10.9.2 and Appendices 16.6.4 and 16.6.5.

4.3 FLAG philosophy and assumptions in freshwater management

The FLAG used some fundamental philosophies and assumptions that developed throughout the process. These are listed below, along with the respective Manawhenua ki Mohua (MKM) perspectives:

Table 1 Key FLAG Philosophy and Assumptions

#	Key FLAG Philosophies and Assumptions	MKM perspective
1.	If we protect ecological values, we protect other values and uses of water[13].	If the mauri (life force) is protected all other values and uses of wai will be protected.
2.	If we protect the health of the freshwater bodies, we also help protect the coastal waters and habitats these flow into.	*Manawhenua draw attention to the importance of Ki uta ki tai, to replenish the coastal marine environment. Manawhenua recommend that management objectives for the coastal and marine ecosystems are developed – acknowledging the importance of coastal marine ecosystems; the receiving environment for all wai flowing through the domain of Tangaroa* (MKM 2018).[14]
3.	The current situation is generally good for water quality and quantity in Tākaka – we want to keep it this way.	The current situation regarding wai quality and quantity in the Tākaka Catchments is good and needs to be maintained.

[13] This assumption was tested in relation to values such as mahinga kai and swimming in so far as water flows and water quality contributed to those values, and in relation to the recommendations made was found to hold true (based on local knowledge). FLAG held this assumption with the proviso that MKM needed to comment on whether protecting ecological values would protect the mauri of waterbodies.

[14] MKM feedback on the FLAG assumption included the need for more direct consideration of coastal health and inclusion of indicators for health of coastal habitats and mahinga mataitai (coastal food gathering sites). This was incorporated into the recommendations by strengthening the ecosystem health value and management objectives to reflect coastal aspects and inclusion of specific coastal indicators in the attributes identified.

#	Key FLAG Philosophies and Assumptions	MKM perspective
4.	Different catchment areas have different influences on the rivers, aquifers and Te Waikoropupū - and our management should reflect these connections.	Different catchment areas have different influences on the awa (rivers) and aquifers and ngā puna such as Te Waikoropupū – management needs to reflect these connections.
5.	Where water or land use risks are identified, management controls or other responses should be proportional to the significance of each risk.	Where risks to ngā wai (water) and ngā whenua (land) are identified, it is important that management controls reflect the degree of each risk.
6.	Particular land uses (and practices) generate contaminants that can affect water quality - management should focus on these sources.	Particular land use generates contaminants that can affect the quality of wai – therefore it is important to focus on managing these at source.
7.	Where there is uncertainty, we proceed with precaution, enable future management changes and monitor what is happening to inform this.	Where there is uncertainty, it is important to take a precautionary approach to decision-making and monitor what is happening in order to inform future management changes.
8.	Water health can be improved by encouraging restoration of aquatic and riparian habitat.	Wai hauora can be improved by encouraging restoration of aquatic and riparian habitat.
9.	Using water resources is a privilege , not a right. No-one owns water and we should respect water and land resources, giving something back for the benefits received.	*Wai is imbued with wairua and mauri – a spirit and life force of its own. Manawhenua seek to protect this life force for future generations. […] Reciprocity measures highlight the privilege of utilising resources in the catchments, supporting an ethic of respect for ngā wai (water) and ngā whenua (land) resources (MKM 2018).*
10.	We don't know what the future will bring – including social changes and changes in the way land and water is used – we need to provide for flexibility to enable opportunities for this change, while protecting water health now and for future generations.	*Manawhenua stress the importance of wai permits being allocated as a temporary gift, not a right – this acknowledges the responsibility of our generation to look after wai and use it wisely, enabling changes in the way wai is used in the future (MKM 2018).*
11.	The catchments need to be managed holistically and in an integrated manner, considering linkages of water bodies within the catchment, including links to the coast, and the relationship between land use and water health.	*Ki uta ki tai recognises the Tākaka Catchments as an integrated whole. This view of nature acknowledges the relationship between all living things. In order to safeguard the integrity of wai, manawhenua consider it is essential that all activities within the catchments are managed in an integrated way* (MKM 2018).

#	Key FLAG Philosophies and Assumptions	MKM perspective
12.	There are already people doing good things to improve water health in the catchment and these should be promoted and supported. Others should be encouraged and required to also achieve and maintain good practice.	MKM are supportive of initiatives which improve wai hauora in the catchment; such initiatives need to be supported and the use of good practice encouraged
13.	The recommendations package is a first step in improved freshwater management for the Tākaka Catchments and other work is anticipated in the future to refine and develop management responses.	For MKM, safeguarding the mauri and improving the hauora of wai is at the heart of decision-making when considering management options for the Tākaka Catchments; now and in future.

4.3.1 Precautionary approach

FLAG agreed that where uncertainty or lack of information exists, that a precautionary approach is necessary. Our discussions and decision-making highlighted that what we consider to be a precautionary approach, for example in determining limits and management methods, means different things to different people. These differences reflect individual perceptions of risk and consequence, and the level at which these become unacceptable.

The reasons for taking a precautionary approach include:

- Uncertainty and lack of information:
    - We don't fully understand the aquifer systems or pathways for contamination
    - There is a lag time of effects being observed (eg at Waikoropupū) (refer Appendix 16.4)
    - We do not have flow data or attribute data for some locations
    - We have only limited or no data for some water quality attributes
    - We do not know how climate change may affect the system
- Consequences of getting it wrong:
    - Degradation of water quality at Waikoropupū is unacceptable
    - Effects on aquifers may be irreversible
    - Once investment is made by individuals it is difficult and costly to reverse management frameworks.

FLAG adopted the following underlying principles to implement a precautionary approach:

- For areas of risk or uncertainty, advice is sought from qualified experts
- We use the best information available at the time of making decisions
- When taking a risk management approach (for example, to water quality) we allow for review of the management method in the short and medium term as new information is obtained (ie adaptive and responsive management)
- We consider the 'reversibility' of the consequences of our decisions, including permanent or long term effects on river and aquifer health, and impacts on local economics

We expect different parts of the community will ask if the approach is too precautionary, or not precautionary enough. Assessment of this for the community as a whole, is anticipated to be a fundamental point of discussion through the plan notification and public submission process.

4.4 Iwi engagement

4.4.1 Tangata Whenua in the Tākaka FMU

There are seven iwi whose rohe (areas of interest) include the Tākaka FMU:

- *Ngāti Tama ki Te Tau Ihu*
- *Te Ātiawa o Te Waka-a-Māui*
- *Ngāti Rārua*
- *Ngāti Apa ki te Rā Tō*
- *Ngāti Kuia*
- *Ngāti Koata*
- *Ngāti Toa Rangatira*

All Te Tau Ihu iwi[15] have statutory acknowledgements for the coastal marine area, which include the estuaries associated with the Tākaka FMU.

Three of the iwi - Ngāti Tama, Te Ātiawa and Ngāti Apa - have statutory acknowledgements[16] associated with the catchments of the Tākaka River and its tributaries, and Ngāti Kuia have statutory acknowledgement associated with the Anatoki catchment.

Maps of each iwi statutory acknowledgement areas[17] and the associated text outlining their respective associations are available on the Council website. Associations include reference to iwi beliefs around water and its valued place in the Māori world view, historic relationships with the Tākaka area (eg ara/ancient trails, urupa, kainga, mahinga kai, mahinga harakeke and cultivation sites) and treasured fish, bird and plant species that where important to their tūpuna (ancestors).

4.4.2 FLAG engagement with Manawhenua ki Mohua

In 2013-14, Manawhenua ki Mohua (MKM) - who represent the three ahi kā manawhenua iwi[18] (those iwi with members who continue to live locally) were asked by Council to identify a representative to join the Tākaka FLAG. Under the FLAG Terms of Reference, it was recognised that this person was not a representative of any one iwi, but on the group to share their understanding from a Te Ao Māori perspective (Māori world view).

Hui between FLAG and MKM have been somewhat sporadic over the process, but included presentation of the group's values of water and management objectives, and the allocation regime methodology for discussion and feedback.

Further advice from a 2016 hui[19] (meeting) was for matters concerning Mohua/Golden Bay, that iwi engagement should be local, with ahi kā manawhenua, and with hui held at Onetahua marae. Through our ongoing work with MKM, we have sought to better understand tangata whenua values and ensure that our recommendations recognised and embodied those values.

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[15] Including Rangitāne o Wairau

[16] With respect to bodies of water such as lakes, rivers, and wetlands, the Statutory Acknowledgement excludes any part of the bed not owned or controlled by the Crown (Settlement Acts 2014).

[17] While the statutory acknowledgements provide legal recognition of the particular cultural, spiritual, historical and traditional association of an iwi with an area, and identify them as affected parties for resource consent processes, they are only one form of cultural redress used to settle historical Treaty claims and it is recognised that these may not necessarily cover all areas, or aspects, of interest to iwi within their respective rohe.

[18] Ngāti Tama, Te Ātiawa and Ngāti Rarua

[19] Outcome from hui on 6 May 2016 at Council Richmond offices with representatives of Manawhenua ki Mohua, Tiakina te Taiao, Ngāti Tama, and Ngāti Toa Rangatira (all Te Tau Ihu iwi were invited to attend).

FLAG and MKM would have liked the engagement to have been pro-actively supported by Council at an earlier stage in the process. That aside, the experience of FLAG and MKM working together has been a beneficial one for all of those directly involved.

At a hui between Council, FLAG and MKM in April 2017, MKM provided feedback that the approach of using one member on the FLAG, and irregular hui with MKM, did not present sufficient opportunity for iwi involvement in the process. We had also been requesting Council staff engage MKM to provide greater input and feedback on FLAG work.

In response to this, Council and MKM developed a partnership agreement for collaboration on freshwater policy in the Tākaka catchments (signed in April 2018), and from July 2017 another MKM member was appointed to the FLAG to provide further support and input. In addition, Council, on behalf of FLAG, commissioned MKM to prepare a report outlining the local iwi and hapu values and interests in wai/water, their future aspirations, and specific review of the FLAG framework to identify any gaps where tangata whenua values and other iwi interests should be further considered in the framework. This resulted in the Manawhenua Mātauranga Report for the Tākaka Catchments (June 2018), which we considered, incorporating relevant aspects[20] into this Tākaka FMU management package.

The MKM report is available on Council's website and outlines manawhenua mātauranga (knowledge) for Mohua/Golden Bay with respect to integrated management of wai (water) including manawhenua history and whakapapa (ancestry), principles of integrated water and land management and feedback on elements of the draft recommendations package.

4.4.3 Further iwi engagement needed

Aspects of the Manawhenua Mātauranga Report were out of the FLAG scope or unable to be progressed within the project timeframe. We recommend that the MKM report is considered separately by Council to consider these aspects (refer FLAG recommendation 3).

In particular, the definition of cultural tohu (indicators) to utilise within the attribute and freshwater objective framework is something that has been highlighted and supported by FLAG throughout the process, and needs to be progressed by MKM in conjunction with Council.

FLAG recommendation 5:
That Council, in preparation of the Tākaka Freshwater Plan Change, work with Manawhenua ki Mohua, and other Te Tau Ihu Iwi as appropriate, to define cultural tohu to use within the attribute and freshwater objective framework and associated monitoring and reporting.

FLAG acknowledges that Council have additional obligations under RMA Schedule 1 to provide copies of the draft proposed Tākaka Freshwater Plan Change to tangata whenua (including those with statutory acknowledgements) for feedback. We understand from Council staff that this will occur following the Council's decisions on the FLAG non-consensus options and development of a proposed plan change version, prior to public notification.

[20] These points are summarised in the FLAG meeting notes from the 25 October 2018, which are available on the Council's website.

4.5 Public engagement

Our engagement with the local community has involved informal discussions with our respective parts of the community, including informal surveys of opinion, one-on-one conversations and feedback from individuals and groups, as well as more formal engagement processes.

We have offered the opportunity throughout the process for any individual or group to attend a FLAG meeting to discuss their concerns directly with us. This was taken up by several individuals and groups through the process[21].

We also presented information to the Golden Bay Community Board on the values of water and management objectives, and the allocation regime methodology.

We have sought to be transparent with our information and process, with meeting notes and information resources made available on the Council's webpages, and the ongoing ability to feed back or ask questions of FLAG or Council staff through the FLAG coordinator.

Specific feedback on our draft outputs was sought at key milestones. Our values of water summary document was publicly released for feedback in May 2015, but received only limited response.

A specific round of public engagement was initiated in November 2016, with release of an interim report to show our direction regarding water allocation and quality. 165 responses where received from individuals and community, industry and environmental groups. Following this, two public meetings were held in March 2017, which were attended by around 300 people, and feedback at these meetings confirmed the key themes of concern.

Key themes of concern included:

- Protection of Te Waikoropupū Spring and Arthur Marble Aquifer, including concerns around flow and nitrate levels and cultural importance
- Waterbody linkages and the approach to allocation, modelling and use/level of cease takes
- Uncertainty in understanding waterbodies and connections, including availability of data and monitoring, and use of science to underpin decisions
- Use of water as a public resource by individuals and business interests, including resource ownership and value of tourism
- Protection of aquifer drinking water sources
- Security / reliability of supplies, and use of water storage
- FLAG and Council processes, including perceptions of bias and need for further engagement with iwi and public
- Concerns on specific zone allocation regimes
- Water quality, including concerns at specific locations, swimmability, river bank/bed management, and chemical use
- Industry best practice and effects, including good management practice
- Climate change considerations
- Fairness and equity, including water access, water permits, grandfathering, compliance needs, and who pays

[21] This includes individuals: D.Mead, K.Stafford, and Andrew Yuill (who subsequently joined the FLAG from Aug 2015 to Dec 2016), and representatives from Dairy NZ, Trust Power, Ministry for the Environment, Fish and Game, Fonterra and the Onekaka Biodiversity Group. The Golden Bay Community Board also advised us of their concerns.

Consequently, we considered and discussed this feedback during meetings and it has informed our work throughout. The feedback did not raise new concerns, but confirmed ones FLAG members had previously raised during group discussions, and highlighted the concerns that are most important to those who gave written feedback or spoke at the public meetings.

The process of consultation with the community was a challenging one for both FLAG and staff advisors, primarily because of:

- the personal attacks on the integrity of FLAG members and staff advisors
- the misunderstandings and incorrect assumptions about the draft framework and our intentions
- misinformation which was widely circulated via online and print media
- the time taken away from progressing discussion and resolution of issues because Council staff that were providing advice to FLAG were diverted in responding to information requests and were unavailable to provide administrative support and advice to FLAG.

FLAG members also attended the hearing for the Waikoropupū Water Conservation Order, which provided a further opportunity to hear community and individual's concerns regarding water management and the protection of Waikoropupū.

4.5.1 Further public engagement

We note that we had not fully developed the content of the water quality management framework at the time of public engagement on the interim report. We discussed a second round of engagement, but decided this would be unlikely to identify different issues from the first round. Council may wish to consider whether further public engagement is needed prior to formally notifying a proposed Tākaka Freshwater Plan Change.

FLAG recommendation 6:
That if the Council considers that further public engagement is needed during preparation of the proposed Tākaka Freshwater Plan Change and Implementation Plan, that the Council undertake that consultation, not FLAG.

We acknowledge that once the proposed plan change is publicly notified, there is also another opportunity for public involvement in lodging submissions on the proposed plan change.

4.6 Stakeholder engagement

We have met with local farmers and industry representatives including Fonterra, DairyNZ and Federated Farmers.

Dairy is a key land use in the FMU and has been the focus of concern in stakeholder and public feedback throughout the process.

We had a field trip day to visit dairy farms, the Fonterra factory, the wastewater treatment plant, and Council water flow measuring sites. The farms visited represented a range of approaches from no irrigation to highly computerised systems, and included looking at and discussing land and water use and management practices.[22] A Fish and Game staff member attended the field trip to talk about riparian restoration work.

[22] Notes from the field trip are available on the Council website.

We also held a meeting with Trustpower and local landowners, with a presentation from Trustpower staff on hydroelectric power, the electricity market and the operation of the Cobb hydroelectric power generation system.

Meetings have been held to update local industry on key information available, the FLAG direction, and to discuss particular aspects of the framework that are likely to affect the Livelihood and Economic value for water, including specific zone allocation regimes.

FLAG members with associations to local industry and non-government organisations have also been sharing information both to and from their respective sectors.

Council staff, on behalf of FLAG, have also liaised with other industry representatives including Beef and Lamb NZ and Horticulture NZ.

4.6.1 Further industry engagement

Further industry engagement is recommended as the proposed Tākaka Freshwater Plan Change is developed by Council. In particular, further engagement is required regarding the acceptability of the security of supplies in each zone to determine if allocation limits need to be further reduced to improve this.

Further engagement is needed on the proposed minimum standards and Risk to Water framework (refer section 11), particularly for those industries identified as having a moderate or high risk to water. This engagement should seek industry feedback on the types of land uses included in the framework, and the appropriateness of requirements, including what implementation timeframes are pragmatically achievable for different industries.

FLAG recommendation 7:
That the Council instruct staff to undertake further industry and stakeholder engagement during preparation of the Tākaka Freshwater Plan Change and Implementation Plan, including on:

a) the acceptability of security of supply in each zone to determine if allocation limits need to be reduced to improve security, and
b) development of minimum standards for high risk to water activities and practices (refer Section 11.2), and
c) development of the Risk to Water framework for land use with moderate to high risk to water (refer Section 11.3), including implementation methods.

4.7 Key information resources

We utilised a wide range of data and information, from a number of sources, to inform our discussions and decisions. This included expert advice on a wide range of topics, Council monitoring and investigation data, and feedback and advice from manawhenua iwi, the public and industry stakeholders. Key sources of written information considered during the process are included in the reference list in Appendix 16.2.

Part 2:
FLAG Outputs

5 Tākaka Freshwater Management Unit (Tākaka FMU)

5.1 Tākaka FMU extent

The Tākaka FMU covers all catchment areas from the Wainui catchment in the east, to the Tukurua catchment in the west, and all of the catchment areas that drain to the Tākaka River and the Arthur Marble Aquifer (refer Figure 2). A small area outside the Tākaka River catchment surrounding the Ngarua Caves is also included as it overlies and therefore potentially recharges part of the Arthur Marble Aquifer.

The Tākaka FMU is intended to replace the previously named Tākaka Water Management Area and incorporates Wainui Bay, which was previously part of the Abel Tasman Water Management Area. This change was made because Wainui Bay has the same 'community of interest' as the other Tākaka catchments so it made sense to include this area in the Tākaka FMU process.

5.2 Tākaka FMU zones

The zones that make up the Tākaka FMU are shown in Figure 3, Figure 4, and Figure 5 and listed in Table 2.

FLAG recommendation 8:
That:

a) the Council adopts the Tākaka Freshwater Management Unit and Zone boundaries as described in Section 5 and set out in Table 2 and Figures 3, 4 and 5; and
b) that these zones form the basis for application of any management methods used for water management in the Tākaka Freshwater Management Unit.

The zones spatially define areas where:

a) allocation limits apply, in order to protect specific waterbodies, and
b) the application of rules for land and water use and discharges to land and water apply, to protect water quality and waterbody health.

The FMU is split into 22 management zones, named for the general catchment area they cover. The zone boundaries are typically surface catchment based, or with boundaries that reflect the groundwater relationships with recharge areas and surface water bodies. As a result, the Tākaka River is managed in several different zones, which reflects its complex linkages with different groundwater bodies throughout the catchment. A further exclusion zone is also defined around Te Waikoropupū Springs.

The Arthur Marble Aquifer (AMA) Recharge, Lower AMA, Coastal Margin and Waikoropupū Exclusion Zones overlap the other zones because of the complex surface and ground water connections and differing management issues for different water bodies (refer Figure 3 and Figure 4). This creates a three dimensional framework of zones, which enable water bodies to be managed consistent with the unique hydrological and special characteristics in each area.

Further information on the characteristics of the Tākaka catchments and waterbodies is available in the reports:

- Water Resources of the Tākaka Water Management Area (Thomas and Harvey 2013);
- A Framework for Setting Water Allocation Limits and Minimum Flows for the Tākaka Water Management Area (Cawthron Report 2977, 2017).
- Ecosystem Health of Te Waikoropupū (Cawthron Report 2949, 2017)

Water takes and land uses within the overlapping areas will be subject to all the relevant policy and rules relating to each of the zones a water take or land use is in. This is shown schematically in Figure 1. For example, a site in the Rototai Zone near the coast will also be subject to the Lower AMA Zone and the Coastal Margin Zone rules, depending on whether the groundwater take is from the Arthur Marble Aquifer or other aquifers.

Figure 1 Schematic cross-section showing overlap of management zones (not to scale)

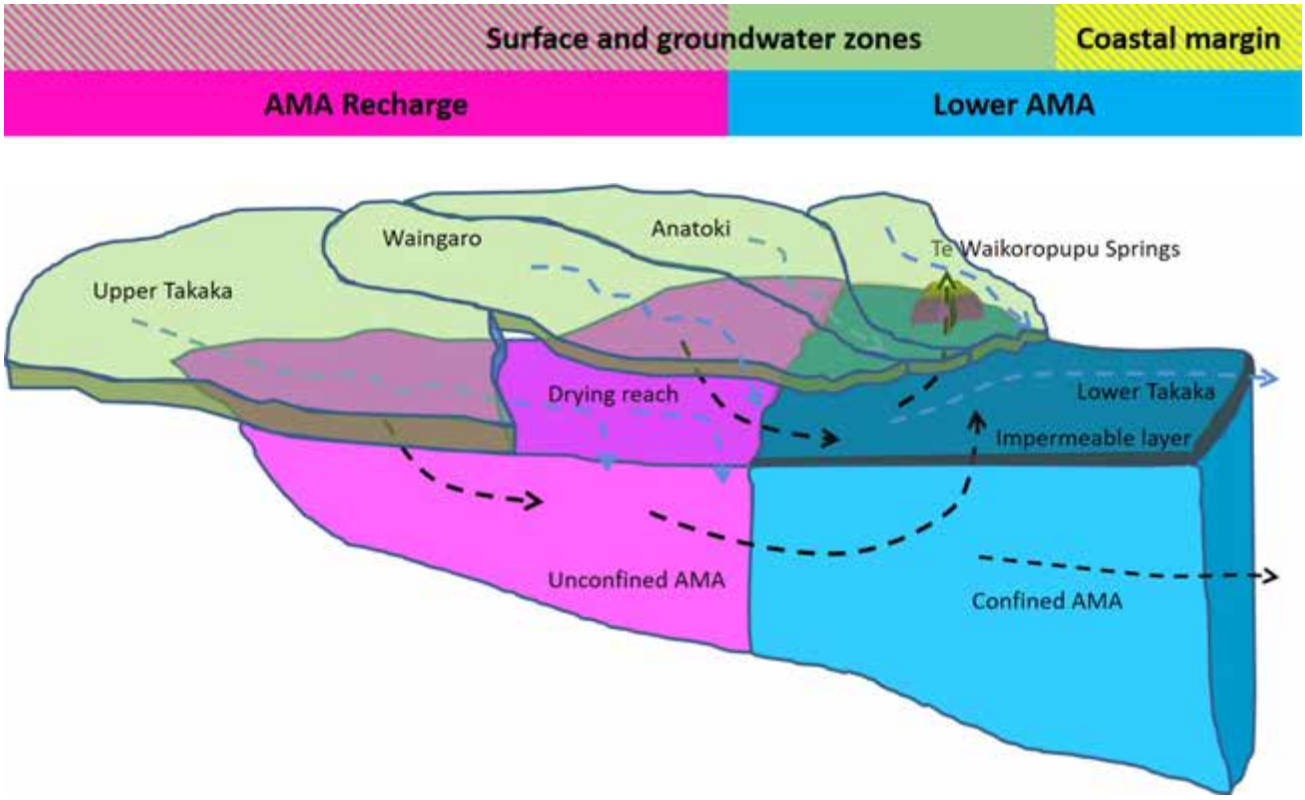


Table 2 Tākaka Freshwater Management Unit Zone Descriptions

Zone Name	Description	Surface Water	Ground water
Arthur Marble Aquifer Recharge[23]	This zone covers areas that may recharge the unconfined parts of the Arthur Marble Aquifer. This zone overlaps other zones, so also applies in: the Upper Tākaka Mainstem and Tākaka Remainder Zones; the upper part of the Waingaro Zone; and upper parts of the Motupipi and Pohara-Clifton catchments, which flow to groundwater over summer.	✓	✓
Upper Tākaka Mainstem	This zone covers the mainstem of the Tākaka River and any groundwater within approximately 50m of the riverbed centerline, between the Harwoods recording station and the confluence with Craigieburn Creek. This reach is influenced by flow releases from the Cobb reservoir.	✓	✓
Tākaka Remainder	This zone covers areas of the Tākaka River and its tributaries south of the confined-unconfined Arthur Marble Aquifer boundary, excluding the reach covered by the Upper Tākaka Mainstem Zone. Many of the tributaries and the lower reach of the Tākaka River become naturally dry during periods of low flow, as water is lost to groundwater.	✓	✓
Lower Arthur Marble Aquifer Zone[23]	This zone underlies zones north of the confined-unconfined Arthur Marble Aquifer boundary. It includes all of the confined aquifer and unconfined parts of the aquifer in the mid Anatoki catchment and upper parts of the Motupipi and Pohara-Clifton catchments. This zone relates only to groundwater takes from the Arthur Marble Aquifer in these areas.	NA	✓
Waingaro	This zone includes all of the Waingaro catchment, including the upper and lower parts that straddle the confined-unconfined parts of the Arthur Marble Aquifer. It also includes part of the Tākaka River due to the interactions with groundwater in this area.	✓	✓
Anatoki	This zone includes all of the Anatoki catchment. Part of the zone overlies the unconfined part of the Arthur Marble Aquifer, but does not influence flows at Te Waikoropupū.[24]	✓	✓
Tākaka Township	This zone includes the Tākaka Township, lower parts of the Tākaka River and groundwater in the Tākaka Gravel Aquifer. Coastal parts of this zone are also subject to the Coastal Margin Zone for groundwater.	✓	✓
Rototai	This zone covers all the area of Rototai, but is a groundwater zone as there is no significant surface water resource. Coastal parts of this zone are also subject to the Coastal Margin Zone for groundwater.	NA	✓
Pohara-Clifton	This zone includes the catchments of Tarakohe, Winter, Ellis, Gibson and Kite Te Tahu Creeks. This zone also overlies parts of the Tākaka Limestone Aquifer. Surface water in the upper parts of these catchments that overlie the unconfined Arthur Marble Aquifer are addressed in the Arthur Marble Aquifer Recharge Zone as they flow to groundwater in summer. Coastal parts of this zone are also subject to the Coastal Margin Zone for groundwater.	✓	✓
Motupipi	This zone manages groundwater and surface water separately as the Motupipi River is spring fed in its upper parts, and its tributaries often dry up. This zone also overlies parts of the Tākaka Limestone and Gravel aquifers. Surface water in the upper parts of this catchment that overlie the unconfined Arthur Marble Aquifer are addressed in the Arthur Marble Aquifer Recharge Zone as they flow to groundwater in summer. Coastal parts of this zone are also subject to the Coastal Margin Zone for groundwater.	✓	✓
Ligar Bay-Tata	This zone covers all the small coastal catchments from Ligar Bay to Tata.	✓	✓
Wainui Bay	This zone covers the Wainui catchment and smaller coastal catchments including the Anatimo, which flows into Wainui Bay – except for those covered by the Wainui North Zone. Coastal parts of this zone are also subject to the Coastal Margin Zone for groundwater.	✓	✓

[23] These are overlapping zones that may result in water takes at the same location or site being subject to two or more zone requirements depending on the type of take - whether it is surface or groundwater.
[24] refer section 16.4.2

Zone Name	Description	Surface Water	Ground water
Wainui North	This zone covers the smaller coastal catchments that flow into the eastern side of Wainui Bay. Coastal parts of this zone are also subject to the Coastal Margin Zone for groundwater.	✓	✓
Tukurua	This zone covers the Tukurua catchment and Little Kaituna Stream.	✓	✓
Onekaka	This zone covers the Onekaka catchment and small coastal catchments to the east.	✓	✓
Pariwhakaoho	This zone covers the Pariwhakaoho catchment and small coastal catchments to the east. Manawhenua have identified the Pariwhakaoho has a culturally significant waterbody, so allocation has been limited to groundwater.	NA	✓
Puremahia	This zone covers the Puremahaia catchment and adjacent small coastal catchments.	✓	✓
Onahau	This zone covers the Onehau and Little Onehau catchment and adjacent small coastal catchments.	✓	✓
Waikoropupū River	This zone covers the lower part of the catchment of the Waikoropupū River from the confluence of Springs River to the confluence with the Tākaka River. It excludes Waikoropupū springs, which are covered by the Arthur Marble Aquifer Recharge and Waikoropupū Surface Catchment zones	✓	✓
Campbell Creek	This zone covers the upper part of the catchment of the Waikoropupū River upstream of the confluence of Waikoropupū River and Springs River. It includes groundwater if available, but excludes any takes from the Arthur Marble Aquifer, which are covered by the Lower Arthur Marble Aquifer Zone.	✓	✓
Waikoropupū Surface Catchments	This zone covers the surface catchments that drain to water bodies within Te Waikoropupū Scenic reserve, including the Fish Creek catchment and areas surrounding the reserve.	✓	✓
Coastal Margin zone[23]	This zone overlaps other zones in coastal areas where salt intrusion into groundwater is a potential risk. It relates only to groundwater takes in these zones, and excludes takes from the Arthur Marble Aquifer.	NA	✓
Waikoropupū Exclusion zone	This zone covers an area determined by a one kilometre (1km) radius circle centred on the mid-point of the Waikoropupū main spring[25].	NA	✓

[25] Refer Section 10.9.3

Figure 2 Tākaka Freshwater Management Unit – Key Locations

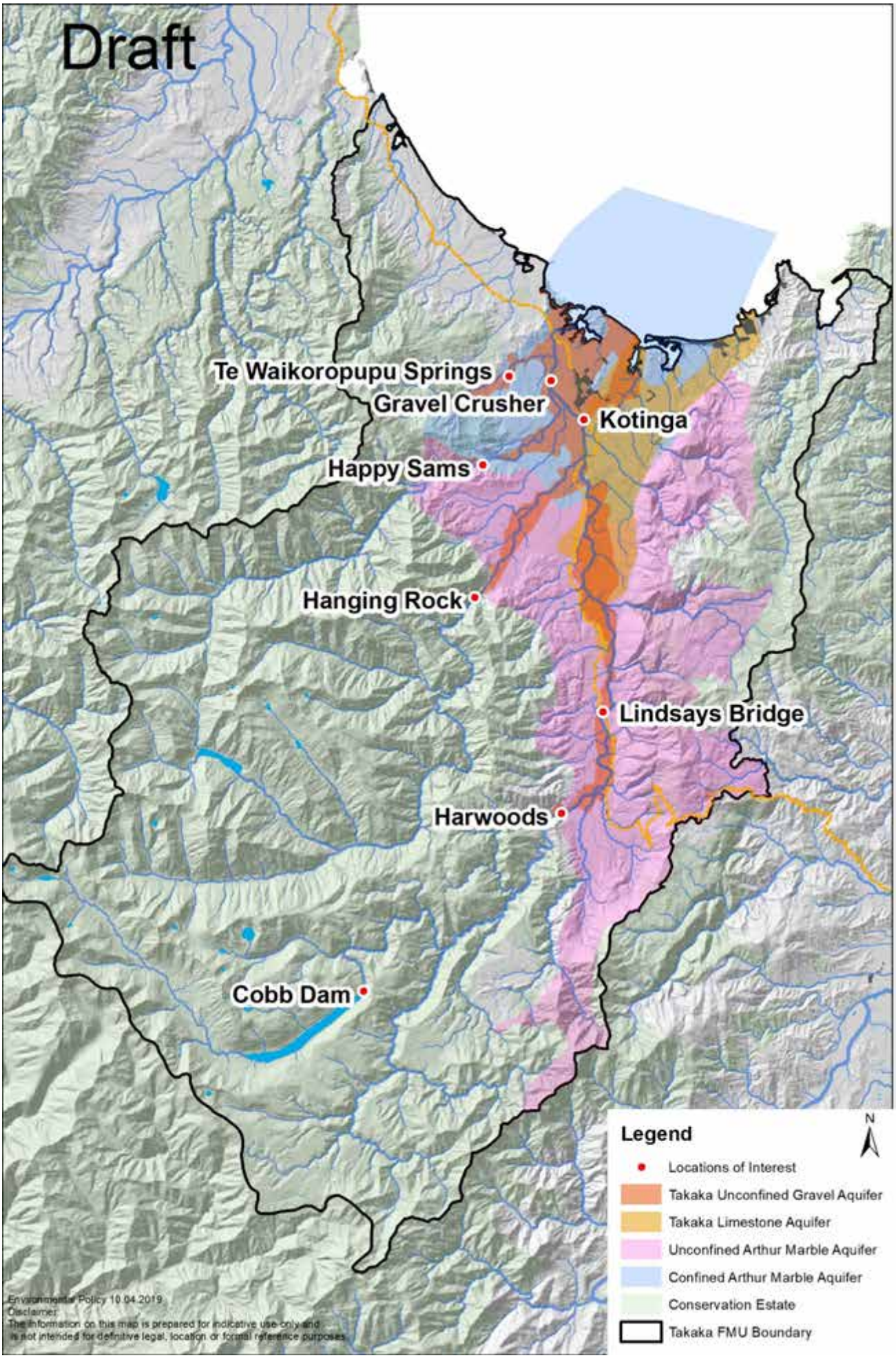


Figure 3 Tākaka FMU – Catchment Based Surface and Groundwater Water Management Zones

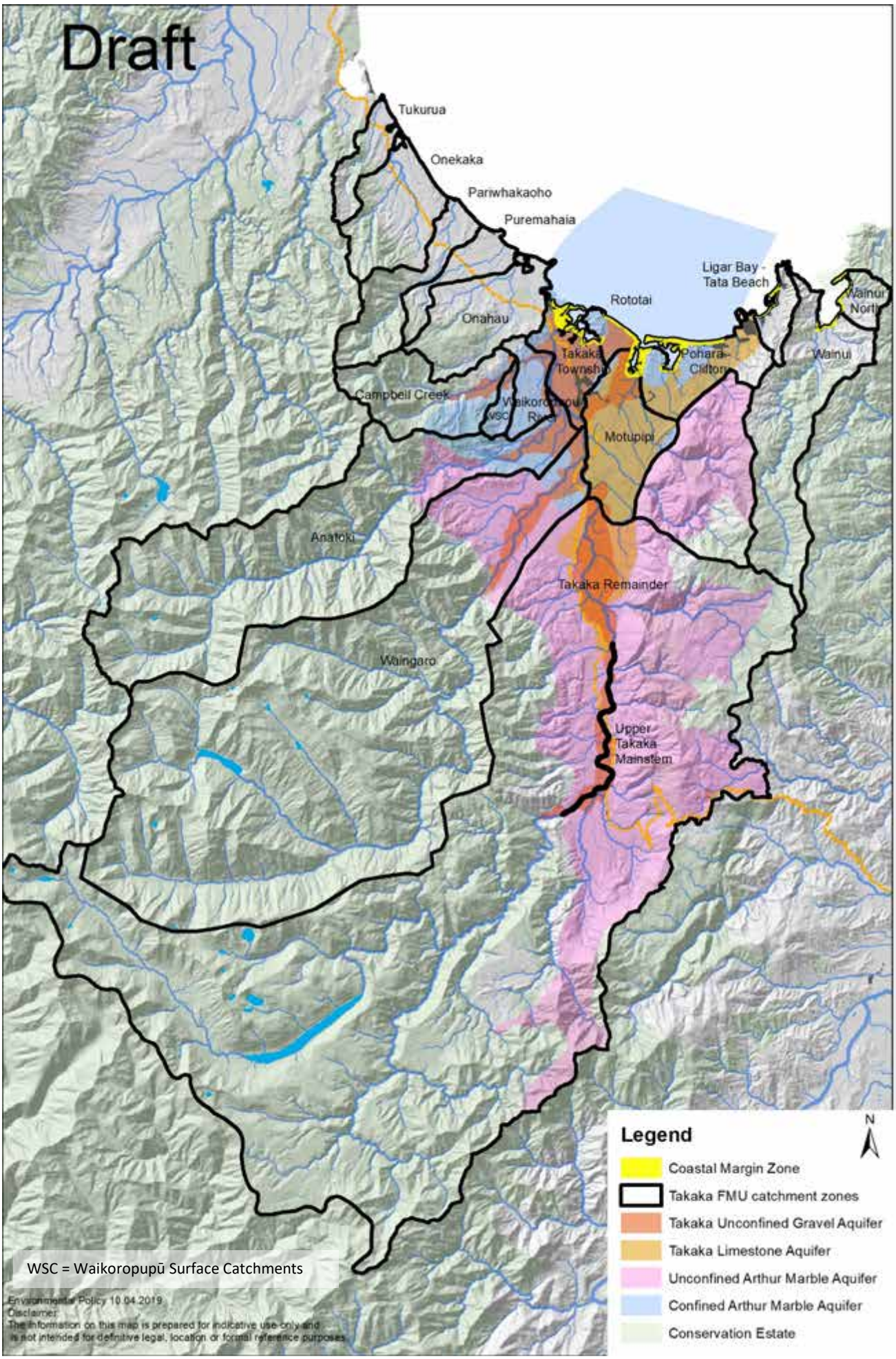


Figure 4 Tākaka FMU – Arthur Marble Aquifer and Waikoropupū Water Management Zones

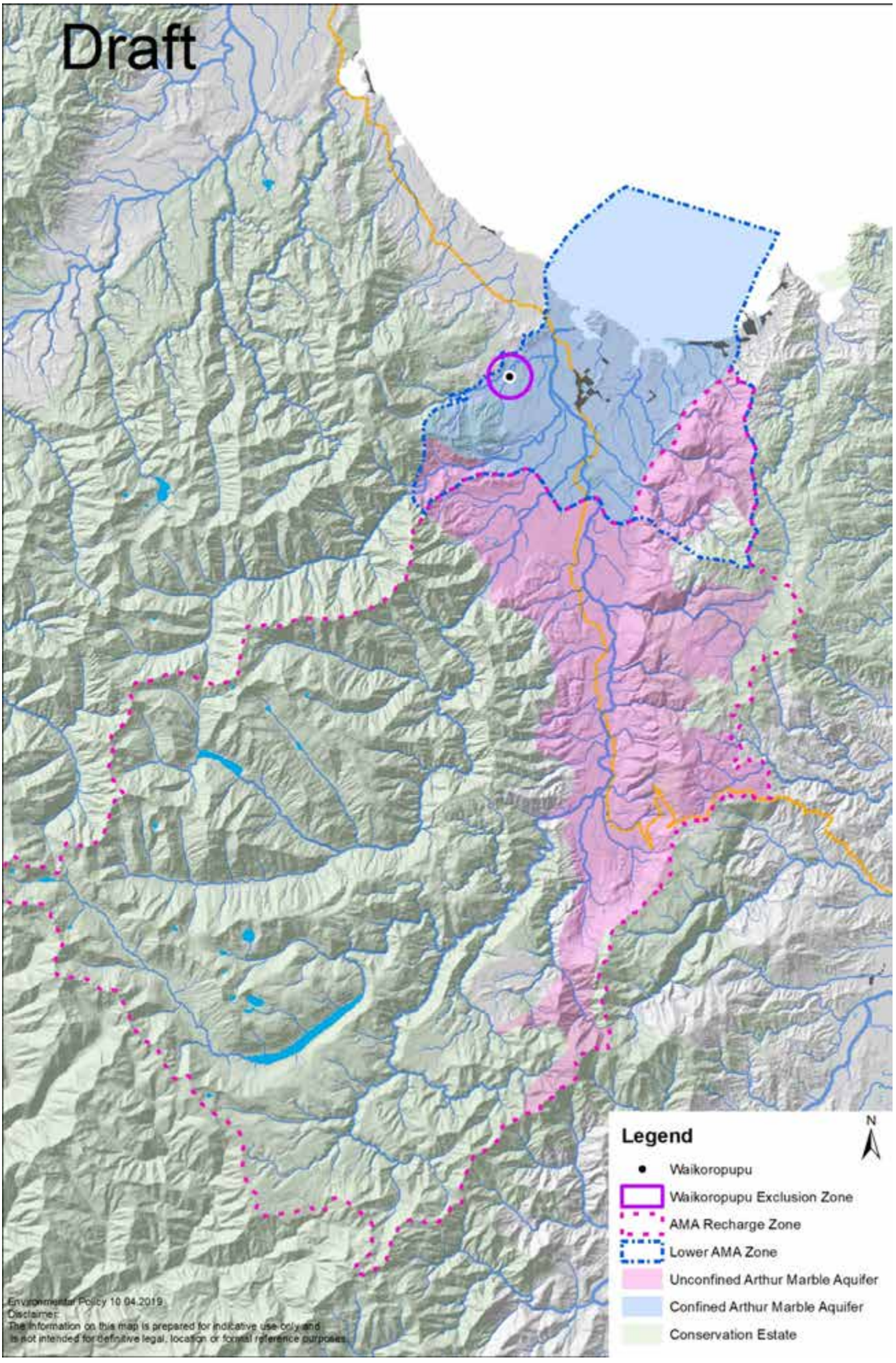
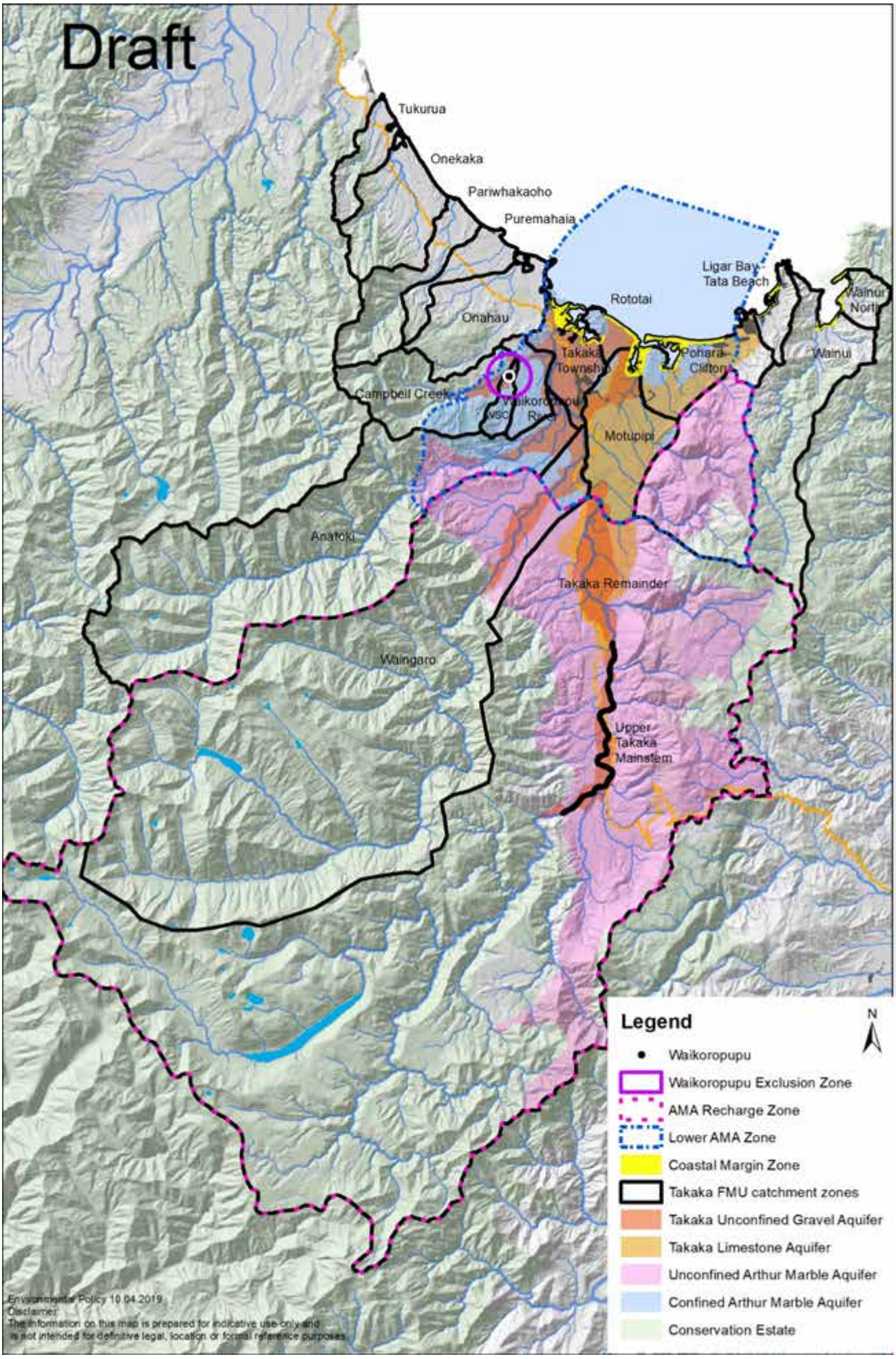


Figure 5 Tākaka Freshwater Management Unit – ALL Zones



6 Values of Water

This section states the values and management objectives as agreed by FLAG through the consensus of all members. The values and management objectives are supported by Manawhenua ki Mohua (MKM) and were refined to reflect MKM feedback, before being finally agreed by FLAG.

We developed the values (and uses)[26] of water and the respective management objectives for the Tākaka FMU through a series of individual and group exercises that explored personal values and beliefs, past and current economic and environmental uses and values of water, and potential future changes and risks that could affect water quantity and quality.

These values and management objectives are specific to the Tākaka FMU and are to be used when establishing freshwater objectives under the NPS-FM (policy CA2).

The key attributes for each value are outlined in Table 5, Section 8 of this report. Those attributes will form the basis for freshwater objectives required under the NPS-FM.

The values identified are listed below and outlined in Sections 6.2 to 6.9:

- **Cultural and spiritual values**
- **Ecosystem health** (compulsory national value)
- **Municipal and domestic water supply**
- **Fishing and food gathering**
- **Livelihood and economic use**
- **Natural form and character**
- **Recreation** (compulsory for human health for recreation)
- **Hydro-electric power generation**

Public feedback on the draft values and management objectives was sought in May 2015, and again through the interim report feedback in November 2016, and subsequent public meetings in 2017. Limited specific feedback on the values and uses was received through these processes, however overall, the feedback confirmed key aspects of importance to the community (refer Section 4.5).

FLAG recommendation 9:
That:

a) the Council adopts the values of water and the associated management objectives defined by FLAG (as stated in Sections 6.2 to 6.9 of this report), and
b) that these values form the basis for any future decisions for water management in the Tākaka Freshwater Management Unit, so that each value is provided for within the environmental limits of the framework.

We considered the national values identified in the July 2014 version of NPS-FM, as defined at that time. The two compulsory values[27] were included, and most[28] of the other national values were included in principle. However, the naming and meaning of each value is in our own words

[26] A value is anything that the water is valued for – this includes uses. It is recognised that 'value' and 'use' will have different meanings to different people.
[27] Ecosystem Health and Human Health for Recreation
[28] Excluding Transport/Tauranga Waka which was not considered to apply in the FMU.

(incorporating te reo as offered by MKM), and is our view of what each value should encompass, as well as referencing local areas and features of importance to iwi and the community.

We also amalgamated values that are highly linked (eg productive uses into Livelihood and Economic use, and mahinga kai health, kai safety and fishing into Fishing, Food and Resource Gathering).

The values and management objectives identified are the key drivers for all elements in the recommendations package, and the aim of the methods identified are to support these values and management objectives, both now and for future generations.

6.1 Note on language used in the values of water

Unless otherwise identified, both Māori and English terms are used in the value descriptions and management objectives to encompass all cultures and all spiritualties.

The aim of this approach is to achieve an all-inclusive definition of the values and objectives, while using the succinct nature of Māori terms relating to water and water management, which often describe complex concepts that have no simple direct English translation, but whose fundamental principles are shared by others. Te reo terms used in this document are further defined in the glossary in Section 16.1.

6.2 Cultural and spiritual values

6.2.1 What this value means

Healthy wai (water) is vital for the well-being, energy and peace of mind of tangata (people). We respect and treasure our sacred wai and interconnected sacred places. Our well-being is reflected by the hauora (health) of our wai.

The purity of wai supports our connection with nature and manawhenua relationships with ngā atua kaitiaki (sacred guardians). Healthy wai imbues peace of mind, revitalising energy and supports tikanga (customary practices), including rituals and ceremonies. Individuals and whānau (families) are able to enjoy and connect with our water bodies now and in the future.

6.2.2 Where does this value apply?

This value applies to all surface and groundwater in the Tākaka FMU. Waterbodies that are considered tapu (sacred) include Te Waikoropupū Springs (including Dancing Sands and Fish Creek Springs)[29].

6.2.3 Management objectives for Cultural and Spiritual Values

All surface and groundwater:

1. All wai (water) in the catchments have a healthy mauri (life force).
2. Water bodies are enhanced over time to increase the hauora (health) of interconnected indigenous habitats and species.
3. Wai is protected for cultural and spiritual uses.

[29] Manawhenua ki Mohua (via MKM) support the values and uses of wai identified by the FLAG. However, from a manawhenua perspective, 'Cultural and Spiritual Values' encompass all the other values and uses and are central to considerations for water management (refer section 11 of the Manawhenua Mātauranga Report, MKM 2018)

Te Waikoropupū, including Dancing Sands and Fish Creek Springs

4. Wai Tāpu (sacred water) is protected.
5. Valued features, taonga (treasures) and unique properties of wai (water) are protected.

6.3 Ecosystem health

6.3.1 What this value means

The Tākaka Catchments have a special environment with rare and unique qualities. From the dynamic estuaries, to the karst and marble areas, and bush-clad national park catchments, wai (water) supports all life and is essential for ecosystems to function and flourish. It is vital that our natural taonga (treasured resources), including awa (rivers), streams, puna (springs), kūkūwai (wetlands), estuaries and marine ecosystems, and coastal and riparian vegetation are protected and maintained to ensure the ongoing haurora (health) of these ecosystems.

6.3.2 Where does this value apply?

Ecosystem health is a compulsory value under the NPS-FM. Our expression of this value applies to all freshwater and waterbodies in the Tākaka FMU.

6.3.3 Management objectives for Ecosystem Health

All surface and groundwater – including rivers, streams, springs, groundwater, wetlands and freshwaters, including where they flow into coastal areas:

1. All surface and ground waters have a healthy mauri (life force) and support healthy coastal and marine receiving environments.

2. There is a diversity of indigenous taonga (flora and fauna) with the expected range of life stages for the water body type.

3. Water quality provides for healthy, functioning and resilient aquatic populations, including estuarine and marine environments (population dynamics, feeding, growth and breeding are occurring within expected ranges for the water body type).

All rivers, streams, springs, lakes and wetlands and freshwaters, including where they flow into coastal areas:

4. There is good habitat diversity, including riparian and wetland vegetation, bed/bank substrate, meander, width/depth, floodplain connectivity and bank shape suitable to aquatic and riparian fauna needs.

6.4 Municipal and domestic water supply

6.4.1 What this value means

Water supply – The freshwater meets the community's potable water needs. Surface and ground water quality and quantity enables domestic water supply to be safe for drinking.

6.4.2 Where does this value apply?

This value applies to all water bodies in the FMU used as raw water sources for domestic use, including for drinking water. This includes surface and ground water resources used by individual

properties, as well as private and public community water supplies. It applies to the source water, not to registered water supply systems, which must also comply with the NZ Drinking Water Standards (NZDWS) and the National Environmental Standard for Sources of Human Drinking Water.

We are aware that some people in the community prefer to drink water without treatment, even if this does not strictly meet the drinking water requirements under the NZDWS, and we think it is important for this aspect of the value to be recognised and provided for.

6.4.3 Management objectives for Water Supply Sources

All surface and ground water used for human drinking water:

1. Water bodies used for human drinking water meet the domestic needs of users.

All surface and ground water used for drinking water, not requiring treatment[30]:

2. Water that does not require treatment is maintained as suitable for drinking without treatment.

All surface and ground water used for drinking water that requires treatment:

3. Water that requires treatment in order to be suitable for use as drinking water is protected from contamination[31] that may require additional treatment to make it suitable for human consumption.

6.5 Fishing, food and resource gathering

6.5.1 What this value means

Fishing and gathering of freshwater and coastal food and resources are important for our families, our wellbeing and our connectedness to the moana (sea) and whenua (land). Kai (food) must be safe to harvest and eat. Mahinga kai (resource gathering places) and mahinga mātaitai (customary seafood gathering sites) must have a healthy mauri (life force) and be able to support taonga species and resources for harvest. The ability to fish and gather food and/or other materials at traditional locations is important and needs to be maintained for future generations.

6.5.2 Where does this value apply?

All surface waters and freshwater, including where it flows into coastal areas.

6.5.3 Management objectives for Fishing, Food and Resource Gathering

1. Kai (food) is safe to harvest and eat.

2. In locations where mahinga kai and mahinga mātaitai (fresh and coastal resource gathering sites) are found, taonga species exist in numbers to support long-term harvest, with a range of desired species present across all life stages.

3. Locations that are valued mahinga kai and mahinga mātaitai are accessible and able to be used to the extent desired in accordance with tikanga (customary practices).

4. All mahinga kai and mahinga mātaitai sites or areas have a healthy mauri (life force).

[30] Treatment is considered to be anything other than basic filtering of water for particulates, and includes any need for chemical treatment, or filtration for pathogens.

[31] Refer also Council responsibilities under the National Environmental Standard for Sources of Human Drinking Water.

6.5.3.1 *Examples of kai species by location/valued mahinga kai*

The following table outlines the key species in zones valued for their fishing, food and resource gathering.

Table 3 Food, material and fishing species

Zone	Species
Western coastal catchments (Tukurua to Little Onahau)	whitebait species, tuna (eels), freshwater shellfish, trout (Onekaka), freshwater koura, watercress, flounder, pipi, tuatua, kutai (mussels), paua
Motupipi catchment	whitebait species, tuna (eels), freshwater shellfish, koura
Tākaka River	whitebait species, tuna (eels), trout
Anatoki and Waingaro Rivers	tuna (eels), trout
Te Waikoropupū River	Tuna (eels), trout, koura, watercress
Motupipi and Waitapu Estuaries	Estuarine shellfish

The MKM report (2018) further identifies 100 plant species, 60 bird species and 45 invertebrate species that are taonga. These species have been used for a number of purposes including food, medicine, dye, fire making, and materials for weaving and making traps, nets, rope, kete (baskets), bowls, houses, carvings, ceremonial pieces, weapons and tools.

6.6 Livelihood and economic use

6.6.1 What this value means

Water of sufficient quality and quantity is important for human consumption, farming, horticulture, aquaculture and tourism livelihoods, and for community wellbeing. It provides for irrigation, food production, stock water and economic opportunities for people, businesses and industries. Water storage can improve security of supply.

6.6.2 Where does this value apply?

This value applies to all surface and groundwater used for irrigation, stock water, industrial and commercial uses and tourism activities.

6.6.3 Management objectives for Livelihood and Economic Use

1. There is an acceptable security of supply for water users – in some areas and for some uses this may require water storage.

2. Water quality is suitable for the economic uses with minimal or no treatment:
    a. Water used for irrigation meets the quality needs of farming and horticulture uses
    b. Water used for stock water meets the stock water drinking standards
    c. Water that is important for tourism meets the needs of tourist activities and meets primary contact (swimming) objectives.

3. Water is used efficiently and water quality is maintained or enhanced to meet the needs of future generations.

6.7 Natural form and character

6.7.1 What this value means

The inherent values of our water bodies connect us with the natural world and for manawhenua, ngā atua kaitiaki (spiritual/sacred guardians) are an integral part of this relationship. People seek out natural areas to nurture ourselves on all levels – spiritually, physically and emotionally. Specific natural values encompass the sound of flowing water, flourishing wai with a healthy mauri (life force), abundant and diverse species - including indigenous taonga species, and the wild and dynamic character and personality of our awa (rivers) and interconnected estuaries. The headwaters in the national park, and the karst landscapes and springs, in particular Te Waikoropupū, provide a special and unique quality to the Tākaka Catchments.

6.7.2 Where does this value apply?

This value applies to all water bodies. A special emphasis is given to the application of this value to Te Waikoropupū Springs.

6.7.3 Management objectives for Natural Form and Character

All water bodies, especially Te Waikoropupū Springs:

1. The natural and physical characteristics of the water bodies, especially within the karst landscapes, national parks and spring systems within the Tākaka Catchments are protected.

All springs, especially Te Waikoropupū Springs:

2. Water flows and quality from spring systems are protected.

6.8 Recreation (including swimming)

6.8.1 What this value means

Swimming[32], fishing, kayaking and tramping are important recreational activities undertaken in the Tākaka Catchments. Recreation is important for well-being. Recreation provides enjoyment and refreshes the mind and body. Recreation is an important social activity, particularly for families and those with favoured traditional spots for swimming or fishing.

6.8.2 Where does this value apply?

Human health for recreation is a compulsory value under the NPS-FM. Our expression of this value applies to *all* surface waters in the Tākaka FMU.

6.8.3 Management objectives for Recreation

1. Surface waters are safe for swimming during the months Nov – April (excluding times of flood flow)
2. Surface waters are safe for secondary contact recreation[33].

[32] Swimming includes consideration of all age groups and abilities, recognising that 'swimming' for very young children (ie child's play) is different to that of adults and may occur in smaller, shallower water bodies. The NPS-FM (since 2017) uses the term 'primary contact'.

[33] Since FLAG completed its work on values and management objectives the NPS-FM has been updated in 2017. In establishing freshwater objectives the regional council in discussion with communities, including tangata whenua, needs to consider how to improve water quality so it is suitable for primary contact more often, unless regional targets have been achieved.

6.9 Hydro-electric power generation

6.9.1 What this value means

Renewable energy generation through hydro-electric use of water is important for economic, as well as environmental reasons. Where freshwater is suitable, hydroelectric power generation is recognised and provided for. Existing generation is protected.

6.9.2 Where does this value apply?

Applies to surface water in the Tākaka FMU as specified in the management objectives.

6.9.3 Management objectives for Hydro-electric Power Generation

Rivers with existing systems - Cobb River, Campbell Creek, Waitui Stream, Onekaka River, Rameka River, Gibson Creek, Ellis Creek, Wainui River:

1. Existing hydro-electric power generation schemes are able to continue to generate electricity as needed, and existing generation is protected.

All Surface water:

2. The future potential for new micro and small scale hydro-electric power generation is provided for.

7 Protection of Te Waikoropupū

7.1 Overview

One of the key areas of consensus between FLAG members from the outset of the process has been the importance of Te Waikoropupū to iwi and the local, regional, national and international communities.

7.1.1 Concerns about water management at Te Waikoropupū

FLAG understands that the key concerns of iwi and the community in the areas that recharge the Arthur Marble Aquifer and Te Waikoropupū are:

- Recognition and protection of Te Waikoropupū as Wai Tapu (sacred water) and a Wāhi Tapu (sacred place) and their importance to iwi and the local community
- Risks to, and protection of, the water quality in both the confined and unconfined parts of the Arthur Marble Aquifer
- Risks to, and protection of, the function of the aquifer, and any microbial or stygofauna communities (animals that live in groundwater systems) which may contribute to the outstanding water clarity in Te Waikoropupū springs
- Risks to the water flows and water quality - especially mauri, water clarity, nitrates and aquatic ecology of Te Waikoropupū springs.
- Water availability and reliable security of supply for Economic and Livelihood values of water in the Arthur Marble Aquifer recharge area.

We recommend a range of protections for Te Waikoropupū for both flows and water quality, and these are referenced in the respective report sections and summarised in Appendix 16.4.5. Background information on Te Waikoropupū and the Arthur Marble Aquifer is included in Appendix 16.4.

With regard to Te Waikoropupū, the FLAG framework seeks to:

1. **Provide a clear definition of the area and outstanding values to be protected** to enable clear application of the relevant rules (refer section 7.2)

2. **Protect the flows at the springs** by:
    a. Setting a minimum flow at the main spring
    b. Providing cease takes (to protect the minimum flow) for all consumptive consented takes in areas potentially influencing the springs
    c. Providing allocation limits in contributing catchments that protect river flow variability and recharge to the aquifers
    d. Providing an additional allocation limit based on flows at the springs that contributing catchments must also comply with
    e. Protect the confined part of the Arthur Marble Aquifer in close proximity to the springs from any new bores or new groundwater takes (refer Section 10.9.3)

3. **Protect the quality of water in the aquifer and springs** by:
    a. Managing risks from land use activities that pose risks to water quality in the aquifer recharge areas (refer sections 11.2 and 11.3)
    b. Managing risks from land use activities that pose risks to water quality that drain directly to the reserve or water bodies entering the reserve (eg Fish Creek)
    c. By supporting riparian habitat restoration for waterways that drain to the reserve (eg Fish Creek) within the Waikoropupū Surface Catchments Zone (refer Section 10.9.4)
    d. By ensuring land use practices that may pose risks to water quality are set back from the reserve (refer Section 11.2.3.2).

7.2 Te Waikoropupū an Outstanding Freshwater Body

In addition to the values of water defined by FLAG, the management framework seeks to afford further protection under the NPS-FM to Te Waikoropupū springs through its identification as an Outstanding Freshwater Body. This brings in the additional requirements under Objective A2(a) and Objective B4 of the NPS-FM, which seeks the specific protection of the significant values of Outstanding Freshwater Bodies.

FLAG recommendation 10:
That:
a) the Council acknowledges and adopts Te Waikoropupū as an Outstanding Freshwater Body under the NPS-FM; and
b) the Council ensures any decisions on freshwater management that may affect Te Waikoropupū protects the outstanding values of those springs being:
    i. Strong artesian flow
    ii. Exceptional water clarity
    iii. Cultural and spiritual values, including its wai tapu (sacred water) and wāhi tapu (sacred place) status

The outstanding values for Te Waikoropupū are listed in Table 4.

Table 4 Outstanding Values of Te Waikoropupū Springs

Outstanding Value	Description	Management Objectives	Key attributes and Freshwater Objectives[34]
Wai Tapu (sacred water) and **Wāhi tapu[35]** (sacred place)	The waterbodies and land surrounding Te Waikoropupū have wai tapu and wāhi tapu status, and are of significant cultural and social value to manawhenua iwi and the local community. The purity and health of the water supports our connection with nature and Papatūānuku (earth mother), imbues peace of mind and revitalising energy, and allows for cultural and spiritual rituals and uses.	Te Waikoropupū is not degraded by human and animal waste discharges, contaminants or excess sediment. Waterbodies within and entering Te Waikoropupū Reserve have healthy mauri or are improved over time.	**Mauri** *(may include other attributes, including those for other values)* *Freshwater Objective yet to be defined[36].*
Strong artesian flow *(of the main basin and Dancing Sands springs)*	Strong flows from the springs within Te Waikoropupū is a fundamental character of its outstanding status. Water flows from the springs are influenced by flows from the Cobb Dam. The character and ecology of the springs has adapted to the current flow regime and it should therefore be maintained.	A minimum flow at the main basin is defined, and protected from the effects of abstraction (other than for priority takes[37])	**Minimum flow** at main basin of 90% of MALF (6895 l/s), protected by cease takes
		The positive artesian pressure in the confined Arthur Marble Aquifer is maintained.	**Positive aquifer pressure** - correlated to groundwater level bore WWD6013 of at least 14.239 metres above mean sea level.
Water clarity *(of the main basin and Dancing Sands springs)*	The waters of Te Waikoropupū are some of the clearest freshwater in the world. Measurements[38] indicate the average water clarity is 75m (±7m standard deviation) and the median is around 77m.	Water clarity is maintained within the measured range.	**Water Clarity at the main spring[39]:** *≥65 m (5th percentile)* *≥70 m (median)*

[34] Refer to discussion of attributes and freshwater objectives in Section 8.

[35] Wāhi tapu is utilised here in a context of wider community translation - to include all cultures and spiritualities. Wāhi tapu is used to identify waters held in highest regard by both Māori and non-Māori and both secular and non-secular view points. The aim of this approach is to achieve an all-inclusive definition of the value, while utilising the succinct nature of Te Reo terms which describe complex concepts that have no simple direct English translation, but whose fundamental principles are shared by others.

[36] The means to assess mauri as a freshwater objective needs to be discussed further with Manawhenua ki Mohua (refer FLAG recommendation 5)

[37] Priority takes include water for public health, animal welfare and protection of water resources – refer a to c of TRMP Policy 30.2.3.1.

[38] Refer report "Continuous Water Clarity Monitoring in Te Waikoropupū Springs", NIWA, April 2018

[39] This is a draft freshwater objective for clarity - it is taken from the TDC submission to the WCO Special Tribunal and may be amended by the recommendations of the Special Tribunal

Other aspects of managing Te Waikoropupū, such as protection of the natural form, character and amenity of the area immediately surrounding the springs is largely under the control of the Department of Conservation as landowner and administrator of the scenic reserve and as reflected in Te Waikoropupū Springs Management Plan (DoC March 2009).

In support of Te Waikoropupū Springs management plan (DoC 2009), the TRMP already includes policy and rules regarding access to the water of the springs[40] with the aim of reducing the risk of didymo introduction, and to account for iwi values in protecting the mauri and wairua of the Springs.

7.3 Role of a Water Conservation Order

From the beginning of the FLAG process, we have known of the desire for a Water Conservation Order (WCO) for Waikoropupū and the Arthur Marble Aquifer, and have been keen for the FLAG and WCO processes to be integrated. Early on, we acknowledged a WCO as a possible tool to recommend that Council pursue for protecting key aspects of Te Waikoropupū, as this would elevate relevant aspects of the water management framework to a national level of protection. We intended to consider this approach once the draft provisions of the Tākaka Freshwater Plan Change had been defined. However, that intention has since been superseded by the application by Ngāti Tama Ki Te Waipounamu Trust and Andrew Yuill, for a Water Conservation Order over Te Waikoropupū and the Arthur Marble Aquifer, which was accepted by the Minister for the Environment in June 2017.

The FLAG expressed its support for a WCO for the springs at the Special Tribunal hearing in 2018. We note that regional plans have methods available for managing water and land use that are not available under a WCO, and therefore the two instruments are complementary in protecting water health in the Tākaka FMU.

A WCO can impose restrictions or prohibitions on the exercise of specified regional councils' powers under the RMA 1991 as they relate to water – in particular relating to management of flows or water levels, allocation, contaminant loadings, temperature and pressure. WCOs do not affect or restrict any resource consent already granted, or lawful use established in respect of the water body, before the order is made (i.e. they are not retrospective, unlike regional rules). WCOs cannot directly affect or restrict land uses.

A significant part of the proposed water quality framework that cannot be replicated by a WCO, are the land use and practice management methods (refer sections 11.2 and 11.3). Management of land use is considered a vital aspect to the management of diffuse discharges, not adequately captured by existing regional discharge rules.

The recommendations of the Special Tribunal and the subsequent gazetted WCO that results from the statutory[41] process will influence the framework proposed by FLAG relating to Te Waikoropupū and the area that recharges the Arthur Marble Aquifer. However, because of the complementary aspects of the proposed framework, including the provisions relating to other catchment areas, we recommend that you continue work to progress the freshwater management framework to a notified plan change. This will ensure that protections within our framework are implemented in the FMU while the WCO process progresses (refer FLAG recommendation 4).

[40] Refer issue 27.6.1.7, policy 37.6.3.2, rules 28.3.2.1, 28.3.2.2, 28.3.3.1, 28.3.3.2, 28.4.2.1 and 28.4.2.2
[41] Administered by the Environmental Protection Authority

8 Freshwater Objectives and Limits Setting

8.1 Overview of process

FLAG has sought to follow the process outlined in NPS-FM policy CA2, which includes:

1. Identification of values of water (Policy CA2 a and b)
2. Identifying attributes for the values (Policy CA2 c i and ii)
3. Formulating freshwater objectives using:
    a. States from the attributes in NPSFM appendix 2 (Policy CA2 d and e (i))
    b. Numeric or narrative terms for attributes not in appendix 2

In completing steps 1 and 2, we spent a number of meetings discussing and deciding the water attributes that are important for the values of water identified. FLAG, with input from MKM, have identified a list of 15 key attributes or attribute topics (refer Section 8.2) and the attributes that make Te Waikoropupū an Outstanding Freshwater Body (refer Section 7.2).

We discussed suitable metrics/units, statistics, attribute state bands and current states with the assistance of Council science staff and external modelling experts[42], but have not yet completed work to assign numerical values in formulating Freshwater Objectives (ie step 3 above – refer Section 8.3).

8.2 Key attributes for water quality and quantity management

Attributes are measurable characteristics of water that support particular values and uses of water.

We have considered the attributes necessary to support and enable the values and uses of water identified for the Tākaka FMU, and have identified the following key characteristics:

1. Mauri and wairua[43] (as central to catchment hauora/health)
2. Water clarity
3. Macro-invertebrates
4. Fine sediment in water and on bed
5. Riparian and aquatic habitat (including water shading, food sources and habitat)
6. Dissolved Oxygen
7. Dissolved Organic Carbon
8. Nutrients: Nitrate and Phosphorus
9. Nuisance aquatic plants / pest plants (macrophytes, periphyton and phytoplankton)
10. Microbial pathogens - as indicated by *E.coli or Enterococci in coastal environments*
11. Flow of wai – including river and spring flows (in particular at Te Waikoropupū)
12. Groundwater levels (aquifers)
13. Security of water (wai) supply

[42] Undertaken as part of consideration of the use of a 'Wheel of Water' approach to communication - a method that was not progressed by the group

[43] Refer glossary for an explanation of these terms.

14. Taonga species[44] (specific tohu to be determined by MKM - eg kotuku, eel and elvers, inanga, koura, plants and birds)
15. Contaminants (specific contaminants to be determined)
16. Coastal and estuarine indicators (specific indicators still to be determined)

The values of water that these attributes relate to are summarized in Table 5.

There is a desire to include additional attributes that reflect economic outcomes of water use.

We considered other attributes, for example economic indicators such as milk solids, tourist numbers or revenue, mussel harvesting days, numbers of commercial businesses, and percentage of business demand for water met. However, no one attribute was considered to adequately reflect the existing and future uses of water, or was sufficiently focused on aspects that are primarily dependent on water (rather than other market factors), and so security of supply was progressed as the key attribute for the Livelihood and Economic value. Further economic analysis work as discussed in Section 14 may identify suitable additional attributes or metrics.

We recognised that input from Manawhenua ki Mohua was needed on appropriate cultural attributes or indicators. The Manawhenua Mātauranga Report (MKM 2018) confirmed the need for MKM to undertake further work to define suitable cultural tohu (indicators) to inform better understanding of the hauora (health) of water and ecosystems in the Tākaka FMU.

During discussion on attributes, public access was raised as an important indicator of whether some values and management objectives could be achieved, such as Recreation, Fishing, Food and Resource Gathering, and Cultural and Spiritual Values. Addressing public access was considered out of scope regarding the focus on water quantity and quality characteristics. However, safe public access, in appropriate locations, is something that should be considered by Council in the wider provision for the values of water.

Indicators of water use efficiency and water storage are of interest to us, but have not been considered as specific attributes. The promotion of efficient water use and storage are potential management approaches to address issues around security (reliability) of supply and water availability, and both are currently promoted through existing polices and methods in the TRMP[45]. We think further consideration needs to be given to how use of water storage can be further promoted and this is discussed further in Section 12.

Not all values or attributes are applicable in all zones, and some attributes are more difficult to measure or assess than others. For some attributes and identified units, no previous data is held for comparison with goals and consideration of appropriate future monitoring work is needed (refer Section 13.3).

For those attributes (and metrics) not included in Appendix 2 of the NPS-FM (attributes for the compulsory National values) we have considered possible attribute banding (A to D) for each attribute (refer Appendix 16.3).

[44] Staff discussion with MKM on Taonga species identified some key species, kotuku, eel & elvers, inanga, koura, plants/birds and a desire for species to be used as tohu that represented different parts of the catchments (ie upper catchment, rivers, smaller streams and coastal, as well as alternatives to specific species such as riparian vegetation cover and fish passage. Further work is needed by MKM to refine appropriate tohu for this.

[45] refer TRMP policies 30.2.3.22, 30.1.3.22 and 30.2.3.24

Table 5 Key Attributes for Values of Water

Attribute defined by FLAG[46]	Cultural and Spiritual	Ecosystem Health	Water Supply	Fishing, Food and Resource Gathering	Livelihood and Economic	Natural Form and Character	Recreation	Hydro-electric Power Generation
Mauri and wairua[47]	✓	✓	✓	✓	✓	✓	✓	✓
Water clarity	✓	✓		✓	✓[48]	✓	✓	
Macro-invertebrates	✓	✓		✓		✓		
Fine Sediment	✓	✓	✓[49]	✓	✓[48]	✓	✓	✓[49]
Riparian and Aquatic Habitat	✓	✓		✓		✓		
Dissolved Oxygen	✓	✓		✓				
Dissolved Organic Carbon	✓	✓[50]						
Nutrients[51] (Nitrate & Phosphorus)	✓	✓		✓	✓[48]	✓		
Nuisance & pest plants	✓	✓	✓[49]	✓	✓[48, 49]	✓	✓	✓[49]
Microbial pathogens	✓		✓	✓	✓		✓	
Flow of wai	✓	✓	✓	✓	✓	✓	✓	✓
Groundwater levels	✓	✓[50]	✓		✓			
Security of wai supply (for abstractive use)	✓		✓		✓			✓
Taonga species[47]	✓	✓		✓	✓[48]	✓		✓[49]
Contaminants[52]	✓	✓	✓	✓	✓[48]	✓	✓	
Coastal & Estuarine indicators[52]	✓	✓		✓	✓[48]	✓	✓	

[46] Including input from Manawhenua ki Mohua
[47] Cultural tohu for this to be developed / confirmed by Manawhenua ki Mohua
[48] Especially for tourism
[49] Regarding functioning of water intake structures
[50] Regarding aquifer health
[51] Regarding nuisance plant growth and aquatic toxicity
[52] Refer Appendix 16.3

8.3 Establishing freshwater objectives and setting limits

8.3.1 Developing freshwater objectives under the NPS-FM

FLAG recommendation 11:
That the Council instruct staff to:

a) Complete work on the definition of metrics, statistics and numerical values for the identified attributes of water to define Freshwater Objectives for the Tākaka Freshwater Management Unit; and
b) for any Freshwater Objective not currently being met, to define limits and targets to achieve the Freshwater Objectives; and
c) to provide the summary of freshwater objectives and any limits and targets to FLAG for feedback.

Freshwater objectives are defined in the NPS-FM as the intended environmental outcomes in a Freshwater Management Unit.

For the compulsory national values (Ecosystem Health and Human Health for recreation) that have attributes listed in the attribute tables in the NPS-FM, the national objectives framework (Policy CA2 e) directs councils to assign the applicable specified numeric attribute states as the freshwater objective. For other values or attributes not in the NPS-FM attribute tables, you must assign numeric values where practicable, or otherwise establish these in narrative terms.

Section 8.2 defines the key attributes of freshwater defined by FLAG, and the NPS-FM includes attributes that are compulsory for the two compulsory National values. In addition, Council scientists have provided advice to FLAG on attributes that are monitored within Council's State of the Environment (SOE) programme that are important to consider, particularly where they are needed to assist in assessment of other attributes (for example water temperature has impacts on other attributes such as Dissolved Oxygen and Nuisance Plant Growth).

We discussed suitable metrics/units, statistics, attribute state bands and current states with Council science staff and external modelling experts[53]. This included metrics for those attributes not included in the NPS-FM. However work to formulate and assign numerical values to Freshwater Objectives for the FMU has not been completed at the time of writing. Attributes and freshwater objectives related to Te Waikoropupū Springs as an Outstanding Freshwater Body are discussed in Section 7.2.

We have asked Council staff to progress work to identify suitable metrics, statistics and numerical values for the attributes to enable establishment of freshwater objectives for the FMU, taking into consideration:

- The requirements of the NPS-FM, including the attributes provided for the compulsory national values and monitoring and accounting requirements
- The existing monitoring parameters and locations (and requirements) used by Council in the State of the Environment programme
- Consideration of existing and new monitoring locations that may be needed in the FMU.

[53] Undertaken as part of consideration of the use of a 'Wheel of Water' approach to communication - a method that was not progressed by the group

Council staff have advised that this work has been progressed with definition of metrics and statistics across the attributes (refer Appendix 16.3), but has not been finalised as yet, to provide draft freshwater objectives for the FMU. FLAG request that once this work is completed the Council bring the draft freshwater objectives back to us for review.

Council staff have advised us that future monitoring will be influenced by available budgets and where new parameters or new sites are identified that require additional funding, these will need to be included in the Tākaka Freshwater Implementation Plan (refer section 13.2) for Council consideration for funding during the Long Term Plan process.

8.4 Limit setting

The NPS-FM defines a Limit as "the maximum amount of resource use available, which allows a freshwater objective to be met".

For water quantity, the NPS-FM requires Council to set environmental flows and or levels (which is a type of limit) in all FMUs. Environmental flows for rivers and streams must include an allocation limit and a minimum flow (or other flow/s). Environmental levels for other freshwater management units (eg groundwater) must include an allocation limit and a minimum water level (or other level/s).

The minimum flows / levels and allocation limits selected by FLAG are outlined in Section 10.

For water quality, the NPS-FM requires Council to establish freshwater objectives (in accordance with Policies CA1-CA4) and set freshwater quality limits for all FMU having regard to at least the following:

i. the reasonably foreseeable impacts of climate change;
ii. the connection between water bodies; and
iii. the connections between freshwater bodies and coastal water.

Where FMUs do not meet their freshwater objectives the NPS-FM requires council to also set targets and implement methods (regulatory or non-regulatory) to improve water quality over defined timeframes.

While the NPS-FM definition of a limit is reasonably straightforward for water quantity, it is not so clear for water quality, in that it is often the assimilation capacity of water that is discussed (its ability to absorb and process contaminants without adverse effects). In draft guidance on implementing the NPS-FM the Ministry for the Environment has identified that a broader view of 'resource use' may be required to set limits for some attributes. They have further defined limits with regard to water quality to include a range of limit types from management practices to water quality and discharge standards. For example stock exclusion and riparian planting, or sediment bunds are all considered forms of limit[54].

Council staff advise that the provisions on contaminant discharges in the TRMP currently rely on a combination of water standards identified for classified waters, and protection of the values and uses of water[55]. However, there is limited content provided on the values and uses of water for the

[54] MfE March 2018 – A Draft Guide to Limits under the National Policy Statement for Freshwater Management 2014.
[55] Refer TRMP schedules 30A and 30B

Tākaka FMU, and no classification of waters in the Tākaka FMU, except for that applying to the Coastal Marine Area[56].

As the Freshwater Objective work is only partially complete, we have not yet finalized our position on the need for water quality standards as limits or targets. This task will need to be completed by Council (refer FLAG recommendation 11). However, in looking at the methods for managing water quality a number of land use management aspects have been considered, including stock exclusion, water body setbacks and requirement for Risk to Water planning as part of Farm Environment Planning. These aspects are outlined in Section 11.

In addition, water quality standards at Te Waikoropupū Springs are likely to be considered by the Special Tribunal for the Water Conservation Order.

8.4.1 Allocation of contaminants and regulatory caps

The term 'allocation' is also used in the NPS-FM regarding water quality, with the concept that total acceptable or target loads of contaminants can be defined and then apportioned out to those undertaking activities that generate those contaminants so they only discharge up to their allocated amount (cap).

We do not consider it practicable or necessary to 'allocate' contaminants in the Tākaka FMU at this time. While we can estimate what may enter the system from different land uses[57] and could measure what is coming out the 'bottom', we do not have sufficiently robust scientific understanding of the complex subterranean system to confidently attribute specific quantities of containments to different land uses and natural sources, particularly with some of the low levels monitored. This makes 'sizing the contaminant pie' difficult. In addition, there is discomfort amongst members of FLAG and the local community that this form of allocation generates a perception of a 'license to pollute'.

We note that the option of allocation for contaminants of concern – such as nitrate – may be reconsidered in the future once good management practice is implemented across the FMU and further information is obtained on the key attributes for water quality, potential sources of contaminants, future trends and consideration of the recommendations made by the Special Tribunal for the Water Conservation Order.

9 Management and Implementation Methods

9.1 Introduction

The methods available to Council to address resource management issues and to implement objectives and policies in the TRMP are:

- **Regulation -** Regulating resource use activities for their adverse effects through the use of rules, consents, enforcement action and self-regulatory actions by resource users themselves (eg through certified environmental management systems).
- **Non-Regulatory Methods**:

[56] Refer TRMP schedule 36C
[57] Refer Section 16.7.4on Overseer use

- **Investigations and Monitoring -** These methods generate information about resources, and resource uses and their environmental effects.
- **Education and Advocacy -** These methods involve provision of information or facilitating the sharing of information, and promotion of preferred practices for resource management.
- **Works and Services -** The provision or requirement for works and services can be used to enhance the development of communities or to avoid, remedy or mitigate adverse effects.
- **Financial Measures -** Financial measures or charges or other compensatory contributions are a method to encourage or discourage certain resource use practices.

- **Taking No Action -** This method may be used where results may be achieved without Council intervention.

We have identified a number of ways to address freshwater management in the Tākaka FMU. Some elements of our recommendation package can be implemented through several methods or a combination of the methods listed above. In most cases monitoring & investigation is needed to support the other methods, and education and advocacy can play a supporting role in all implementation.

The elements that make up our framework are shown in Figure 6, (and summarised in Sections 9 to 12) for water quantity, water quality and riparian and aquatic habitat. Figure 6 does not cover all aspects of freshwater management, but includes aspects considered by FLAG. The colours of the boxes give an indication of the potential methods for implementation, including regulatory and non regulatory approaches. A summary of potential regulatory content is included in Appendix 16.5.

We have not considered some aspects of the framework fully[58] because of time constraints and our focus on particular water quality and quantity management issues, however we have identified further work on these that Council should consider in the management of freshwater in Tākaka and Tasman wide (refer section 12 and 15).

Council staff have considered the implementation of parts of our framework and they are turning their minds to drafting plan change content and an implementation plan. However, this does not form part of our recommendations package, as we decided that there are key decisions on the implementation methods that need to be made by Council, before the technical planning and drafting work can be further progressed.

We are keen to have a 'line-of-sight' review prior to public notification of any plan change so that we can understand how our recommendations have been developed (refer recommendation 2).

[58] These are marked with an asterisk (*) in Figure 6

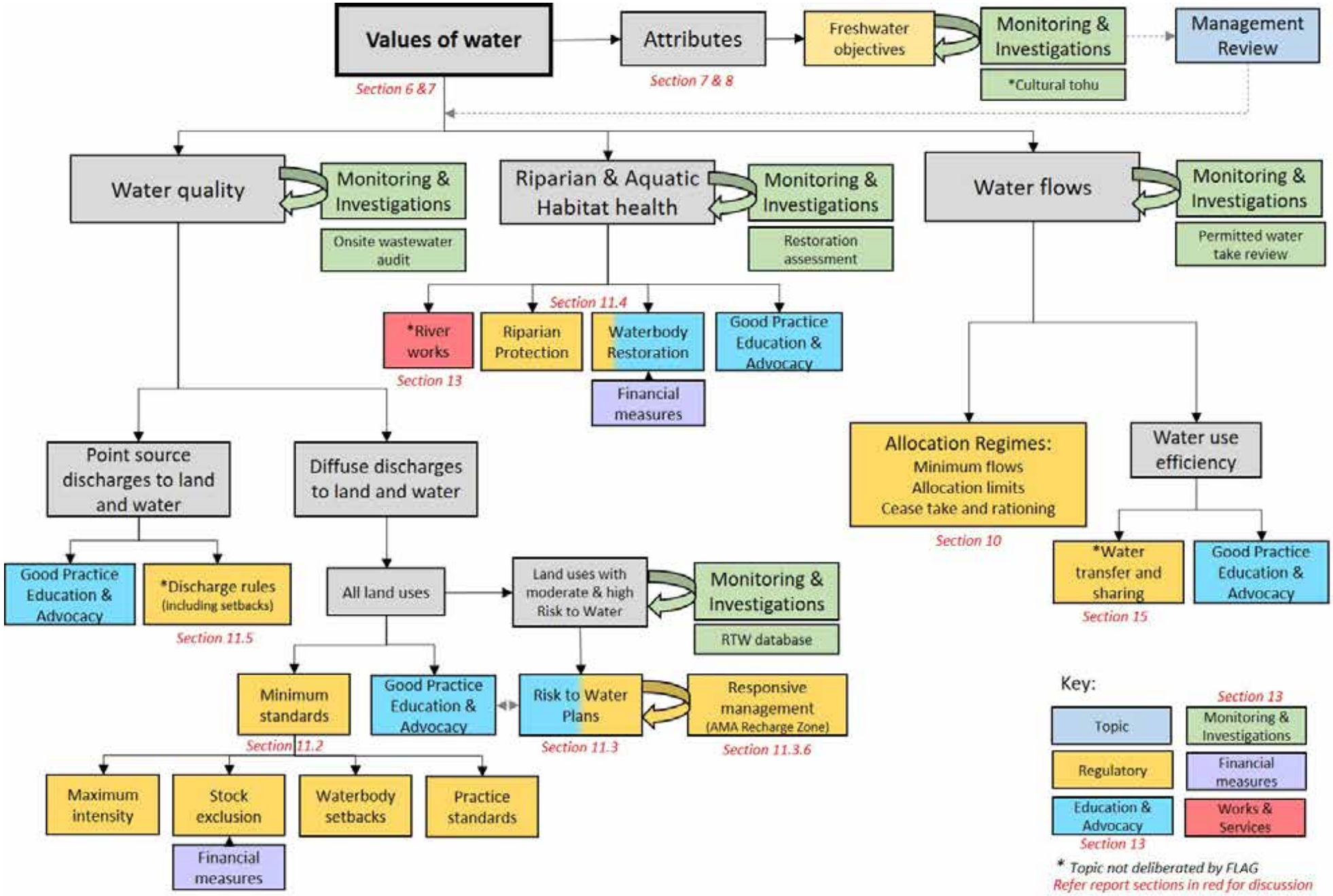


Figure 6 Summary of potential freshwater management methods

10 Allocation Framework

This section outlines the FLAG recommendations for TRMP amendments for environmental flows and levels, and allocation limits as consistent with the NPS-FM section B.

Our considerations regarding water quantity management in the Tākaka FMU have sought to address the requirements of the NPS-FM, and provision of water allocation within sustainable limits.

10.1 Current context

The following is a brief outline of the current situation as we understand it.

There are no currently minimum flows/levels or allocation limits for any of the Tākaka FMU zones within the Tasman Resource Management Plan (TRMP). Both minimum flows/levels and allocation limits are required under the NPS-FM.

An informal allocation limit was determined in 1991 for the Arthur Marble Recharge area, but FLAG understands this does not have legal status under the current TRMP, plus it did not include consideration of minimum flows, or provision for cease take within the contributing catchments.

There is an informal waiting list[59] for new water takes in the Tākaka and Waingaro catchments, which are within the Arthur Marble Recharge area.

Currently, because there is no allocation limit in the TRMP, new applications for water take and use in the FMU are processed as Restricted Discretionary Activities and allocation amounts are considered on a case-by-case basis, using default policies for determining cumulative allocations – using either 10% or up to 33% of the 5-year low flow[60] depending on whether or not the water body has regional or national significance[61].

At present only seven of the 78 consented consumptive water takes in the Tākaka FMU have a cease take trigger included in their consent that requires them to stop taking water when rivers reach a certain low flow level. For all other consents, directions on rationing and cease take are made by the Dry Weather Task Force[62] during droughts, based on considerations of local soil and water body conditions, water use and demand, and forecast rainfall. These directions are made using Council's powers under Section 329 of the RMA (Water Shortage Direction).

10.2 Methods and approaches considered

We considered a number of issues and approaches to management of water allocation, including:

- the method for determining minimum flows and allocation limits, and what this needed to achieve (refer Section 10.6)
- whether the status of permit renewals as controlled activities should be reassessed
- what the activity status for takes above allocation limits should be
- whether water could or should be allocated to specific end uses

[59] As of April 2019 there are 11 entries in the waiting list.
[60] The 5-year Low Flow is the annual low flow that has a 1 in 5 chance of occurring each year – refer Appendix 16.6.2
[61] Refer TRMP policies 30.1.3.15 and 30.1.3.16
[62] The Dry Weather Task Force membership includes Council planning and science staff and representatives from iwi, local water resource users, and other interested stakeholders including Fish and Game and DoC

- whether permitted takes, particularly stockwater should be reassessed regarding potential impacts on smalls streams
- how takes on tributaries should be managed to protect against localised over-allocation.

The method used for determining minimum flows/levels and allocation limits is outlined in Sections 10.6 and 10.9, and a summary of the selected allocation regimes for the FMU is provided in Section 10.12.

The activity status for takes above allocation limits is discussed in Section 10.11.2.

The issue of permit renewal status was determined to be an issue that if considered, should be addressed at a regional level. Some members of FLAG and MKM are keen for this to be looked at for the Tākaka FMU because the current controlled consent status means that Council cannot decline renewal applications, which creates an ongoing 'right' to water that may prevent water transfer to 'better value' uses[63] in the future. Associated with this, is a concern over the 'first-in-first-served' approach promoted by the RMA. These aspects are identified in Section 15 for further consideration by Council.

The issue of permitted takes on small streams is discussed in Section 12 and management of tributaries takes is discussed in Section 10.11.1.

The staff advice regarding allocation to specific end uses is that allocation limits cannot be reduced to arbitrarily constrain people and the community's ability to provide for their wellbeing, and any decision on preferences for allocating uses of water requires an evaluation of the implications of it not being available for other uses or purposes. There has to be significant community benefit, cost or risk in one use compared with other uses to support any preference or constraint. The difficulties in establishing this have meant that few use preferences or priorities reserved in allocable water have been established in NZ to date. In Tasman, community water supplies is the only significant use reserved in some water bodies. Given these difficulties, we did not pursue this further.

10.3 Allocation framework overview

Key points about the allocation framework approach are:

1. The allocation framework is based on first protecting the ecological health of the waterbodies – this is consistent with the NPS-FM and Te Mana O Te Wai philosophy
2. Expert freshwater ecologist advice from Cawthron Institute has been used to advise on the most appropriate methodology for setting limits within the allocation regime, and to determine the requirements to provide a low level of risk to instream ecology, resulting in a recommended range for minimum flows and allocation limits, and a recommended regime for each zone
3. Advice on groundwater levels and cease takes to protect groundwater and associated surface water connections, was provided by Joseph Thomas (Council's water resources scientist).
4. We have assessed the recommended regimes against the values of water and associated management objectives, making further amendments to the allocation regimes in some

[63] Refer discussions on the value of water in Section 15 and Appendix 16.9.2

zones to provide protection for Cultural and Spiritual values (ie Pariwhakaoho Zone) and Livelihood and Economic values, regarding security of supply and recognition of existing investment (ie Upper Tākaka Mainstem zone) (refer Appendix 16.3)

5. We have identified options to address concerns in the Anatoki and Arthur Marble Aquifer Recharge zones, but did not reach consensus on these. We outline these concerns and provide reasons for the recommended options for each zone for your decision (refer Appendix 16.6.4 and 16.6.5).
6. The allocation regimes include protection of minimum flows using rationing and cease take triggers. This provides a known level of protection for ecosystem health, and provides increased certainty to water users on security of supply. For many existing permit holders, new triggers will result in a comparative reduction to current security of supply because of the lack of cease take triggers in most existing water permits.
7. It is intended that if greater security of water is sought in any zones, then either the allocation limit would need to be reduced to achieve this, or water can be taken in times of high flow (water harvesting) and stored for use in times of low flow and drought. Any changes to the protection of the minimum flows would erode the level of protection intended for ecosystem health.
8. We have recommended that you seek to promote and further enable the use of off-stream storage for water users to improve their individual security of supply as needed in the future. This would work in conjunction with existing TRMP provisions that provide for harvest of high flows (eg during winter).
9. We intend that the proposed cease takes do not apply to any water permit for community water supply or domestic use and stockwater. This is consistent with the current priority of water use in the TRMP to protect public and animal health during water short periods.
10. The approach to allocation and protection of Ecosystem Health in the Tākaka catchments is intentionally conservative. This recognises the special nature of the water bodies in the FMU, the complexity in their connections, and the uncertainty this complexity generates for their management. Most of the waterbodies of Tākaka FMU are considered to be in relatively good shape for water flows and water quality, and the community wishes to keep them that way. The level of conservativeness also takes into account the potential effects of climate change, and potential new uses of water and land that may arise in the future.
11. Some additional aspects of water quantity management have been identified as needing further consideration by Council at a region-wide level, being issues not limited to the Tākaka catchments. These aspects are outlined in Sections 12 and 15.

FLAG Recommendation 12:

That (subject to FLAG Recommendations 13 and 14) the Council:

a) adopts the methodology and framework for allocation regimes recommended by Cawthron (as outlined in Cawthon Report 2977 January 2017). The regime elements operate as a combined package, and include:
    i. Minimum flows and levels to protect aquatic ecology
    ii. Allocation limits to minimise flat-lining at minimum flow and provide for consumptive uses of water
    iii. Protection of minimum flows with cease take triggers
    iv. Use of rationing triggers where flow recession allows

v. Use of restart triggers to ensure sufficient rainfall has occurred before restart of water takes

b) Acknowledge that adopting this methodology and regime means that all elements of it must be retained to maintain the integrity of the approach, and;

c) Instructs staff to include the allocation regimes in the Tākaka Freshwater Plan Change.

10.4 Aims of allocation framework

Our intent in developing the framework for managing water flows and providing for allocation has been:

1. To meet the requirements of the NPS-FM in safeguarding Ecosystem Health and recognising Te Mana O Te Wai, by considering the health of water first, and seeking to ensure that water abstraction does not adversely impact on the instream ecology of waterbodies and to meet non-abstractive uses such as swimming and fishing;
2. To provide for water use by individuals and the Tākaka community to enable them to provide for their economic, cultural and social wellbeing, through the efficient allocation of water where it is sustainably available.

10.5 FLAG level of consensus

We achieved a significant level of consensus across the allocation framework, including agreement on the method for setting minimum flows/levels and allocation limits to protect instream ecological values. Allocation regimes or approaches including minimum flows, allocation limits, rationing, cease take and restart triggers have been agreed for 20 of the 22 zones (refer Table 8).

This has taken a considerable amount of discussion - over multiple, and sometimes iterative, meetings - to ensure all FLAG members understood the issues and different viewpoints held, until everyone was comfortable with the recommended way forward.

For the remaining two zones – the Anatoki and Arthur Marble Aquifer Recharge Zones – we have identified options for these zones and the associated reasoning for each (refer Appendices 16.6.4 and 16.6.5) to assist you in determining appropriate regimes for these zones. The allocation regime for the Arthur Marble Aquifer Recharge Zone will likely be influenced by recommendations from the Special Tribunal for the Water Conservation Order.

In addition, FLAG reached consensus on additional elements to protect Te Waikoropupū Springs, including provisions in the Waikoropupū Exclusion Zone.

10.6 Method for setting minimum flows and levels and allocation limits

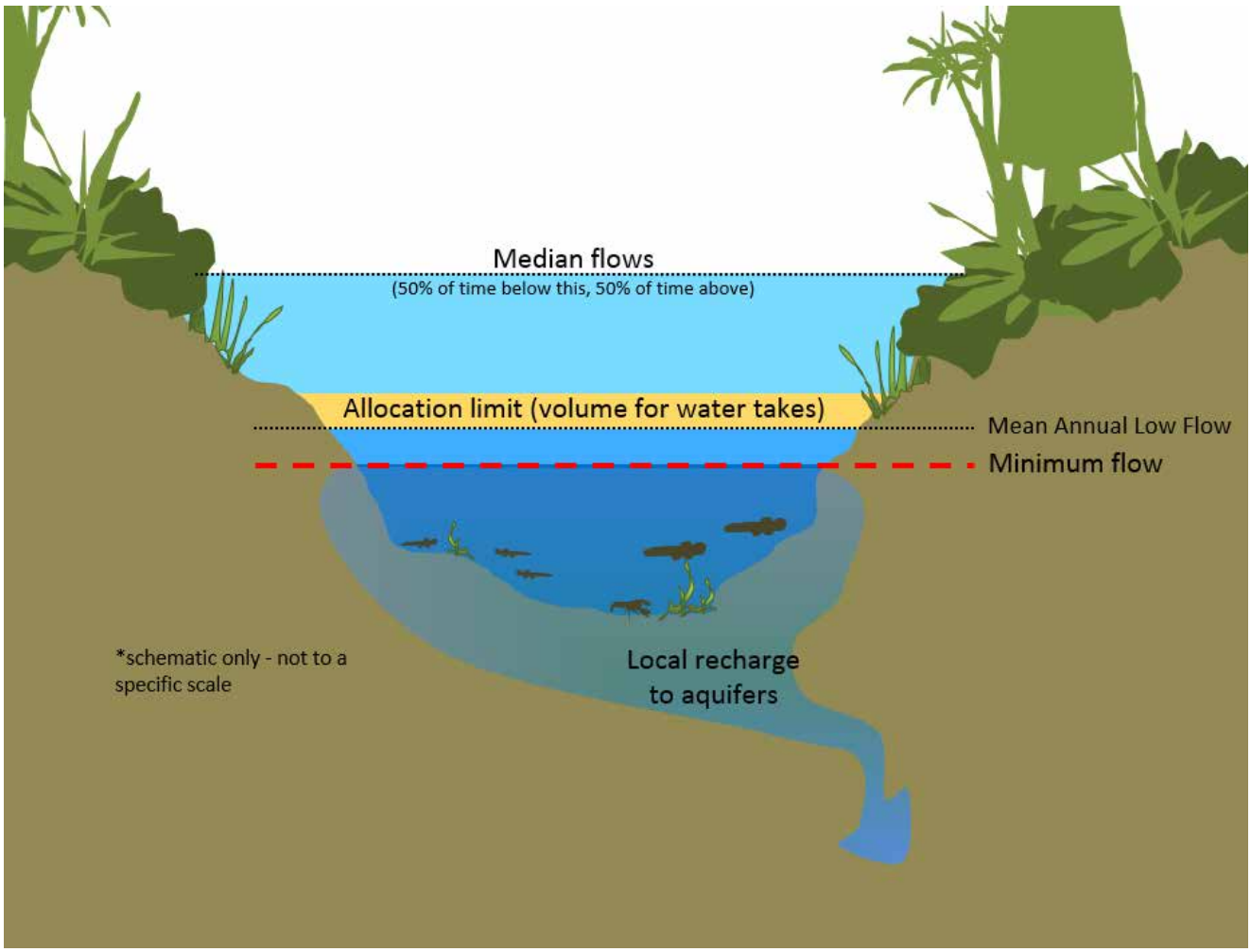
In the Tākaka FMU, water allocation seeks to protect instream ecological values, by providing water for use within ecologically sustainable limits, and wherever possible, achieving an acceptable security of supply for out-of-stream users.

An underlying assumption is that by protecting ecological values, most other values (associated with water remaining in the river or aquifer) will in turn be protected. The goal is to achieve an ecologically sustainable allocation regime in each zone.

The ecologically sustainable allocation regimes focus on avoiding any impact from consumptive water takes on river flows during times of low flow and protecting flow variability at other times.

The approach taken involves identifying the minimum river flow needed to protect the instream ecological values of the waterbody, then setting a suitable allocation limit that allows for consumptive water use, while protecting the minimum flow and avoiding rivers sitting at the minimum flow for prolonged periods ('flat lining'). The allocation limit is a small portion of the median flows, which protects the flushing effects of higher flows (refer Figure 7).

Figure 7 Schematic diagram of allocation components -showing allocation limit (yellow) relative to other flow levels



A cease take trigger is set to stop consumptive water takes in order to protect the minimum flow. This means that when a river reaches a certain low level trigger everyone has to stop taking water, except for domestic and community water supplies (human health) and stock drinking water (animal welfare).

In some cases, the proposed allocation limit has been reviewed and decreased, to reach an acceptable security of supply for abstractive users.

Under FLAG's recommended approach consented water takes will only be able to take water when there is sufficient flow in the river, and will only take a small portion of typical river flows. Harvesting of water at higher flows (eg during winter months) is provided for under the current TRMP provisions.

For groundwater takes that can reduce flows in rivers connected to the groundwater, a similar approach applies with cease takes of groundwater linked to associated river flow triggers. For other groundwater takes, triggers are based on other objectives, such as prevention of seawater intrusion or prevention of effects on neighbouring bores. In some groundwater situations 'cease take' may not be justified due to the high water availability – i.e. if there is not a measurable effect from abstraction during dry periods.

10.6.1 Cawthron recommendations for protection of instream ecological values

Following our establishment of the values and management objectives, and discussion of considerations for allocation and water quantity management, further expert advice was sought on potential impacts on instream ecological values.

In June 2015, Council contracted Dr Roger Young[64], a Freshwater Ecologist with the Cawthron Institute, to help the FLAG consider the instream ecological values in different parts of the FMU, and recommend an approach that could be used to set minimum flows and allocation limits to protect these values.

Key points for the Cawthron methodology:

1. The methodology is focused on risk to instream ecological values and seeks a low-level of risk
2. It uses a qualitative classification of the significance of ecological values for each river using a 'low-moderate-high-significant' scale (refer Figure 8).
3. It uses the 'historic flow method' to calculate minimum flows/levels, and allocation limits, which aims to keep river flows operating within 'typical' conditions - with the assumption that river ecologies will be adapted to these typical conditions
4. It sets allocation limits to protect flow variability to avoid rivers 'flat-lining' at their minimum flows
5. It uses cease takes to protect minimum flows and levels, so during droughts the effects of consumptive abstraction are avoided.

The methodology for the Tākaka FMU is outlined in the report: 'Framework for Setting Water Allocation Limits and Minimum Flows for Tākaka' – Cawthron Report 2977 January 2017, available on Council's website.

Advice on groundwater levels and cease takes to protect groundwater and associated surface water connections was provided by Joseph Thomas, Council's Water Resources Scientist.

The characteristics considered by Dr Young in his ecological value assessments included: the river type and available habitat, the river flow features, including how quickly the river drops during dry periods, water quality, fish passage access and food availability and the specific habitat needs of the fish species expected to be found in the river (including trout and whitebait fisheries).

Dr Young considered these aspects, and in consultation with Council's water resource scientist (Joseph Thomas) and surface water scientist (Trevor James), suggested appropriate minimum flow

[64] Dr Young's dossier is available on the Cawthron website. He has been involved in freshwater ecological work throughout New Zealand, and has been involved in various projects related to freshwater management in the Tākaka catchments. Dr Young's work was peer reviewed by Dr John Hayes, Senior Scientist – Freshwater Fisheries and Ecohydraulics Research at Cawthron.

and allocation limit ranges. We also requested that Dr Young provide a single recommended minimum flow and allocation limit for each zone – from here on referred to as the 'recommended regime' (refer Figure 8).

10.6.2 Historic flow method

Based on advice from Dr Young (Cawthron report 2977, January 2017) and Council staff, we have used the 'Historic Flow Method' to inform what minimum flows should be set.

The Historic Flow Method (percentage of MALF method) was recommended by Dr Young because emerging research at the time suggested habitat modelling methods did not perform any better than simple historic flow metrics[65].

The Historic Flow Method can also be applied more widely across a range of waterbodies than more complex approaches, because it doesn't require detailed site specific information on how water depths and velocities respond to flow - such information is time consuming and expensive to gather.

The Historic Flow Method uses a percentage of the 7-day Mean Annual Low Flow (7day-MALF) established for each river to determine an appropriate minimum flow, based on the assumption that the ecology of a river is adapted to the natural flow regime and typical lowest flows.

MALF is the average of the lowest flows for each year of the river flow record.

MALF has commonly been used as a benchmark for flow setting in New Zealand since the early 1990s, and MALF has been identified as an ecologically relevant flow statistic for trout populations and native fish species, at least where the amount of suitable habitat is predicted to decline through the MALF (Cawthron, January 2017).

(*Note: All references to MALF in the text are in reference to the 7-day MALF unless otherwise stated. For information on what the 7-day MALF is and how it is calculated see Appendix 16.6.1)*

10.6.3 Risk based approach

The method recommended by Cawthron utilises a risk based management approach, where in high ecological value areas minimal risk is accepted and in lower ecological value areas more risk is accepted.

The recommended ranges are:

- **Minimum flow** equals a percentage of the naturalised 7-Day MALF:
    - Significant value sites 90-100% of MALF
    - Moderate-High value sites 70-90% of MALF

- **Allocation limit** equals a percentage of the naturalised 7-Day MALF:
    - Significant value sites 10-20% of MALF
    - Moderate-High value sites 20-30% of MALF

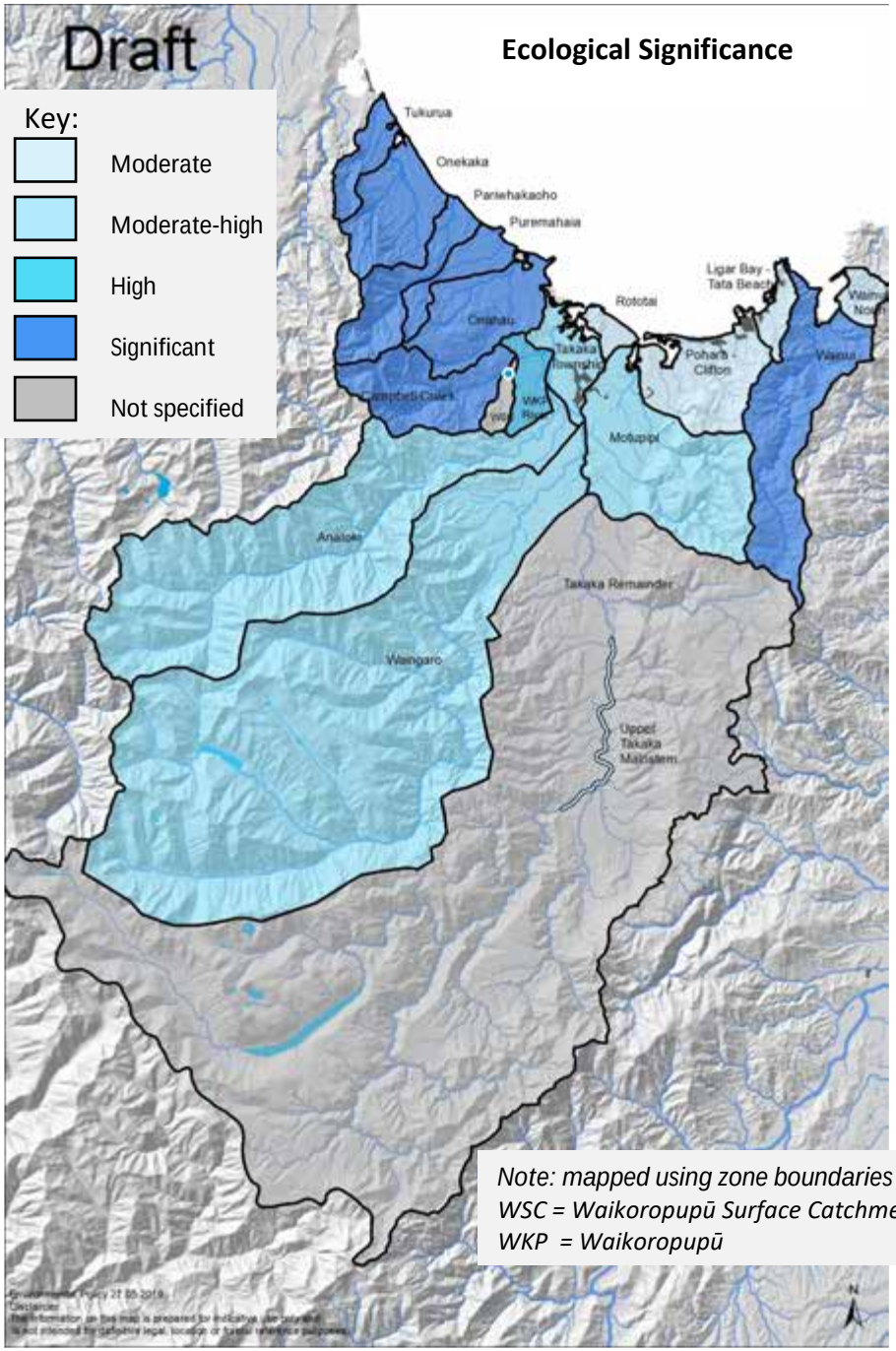
Dr Young has provided his professional opinion on a single ecologically sustainable regime for all zones in the Tākaka FMU where allocation limits are intended to be set. The minimum flows

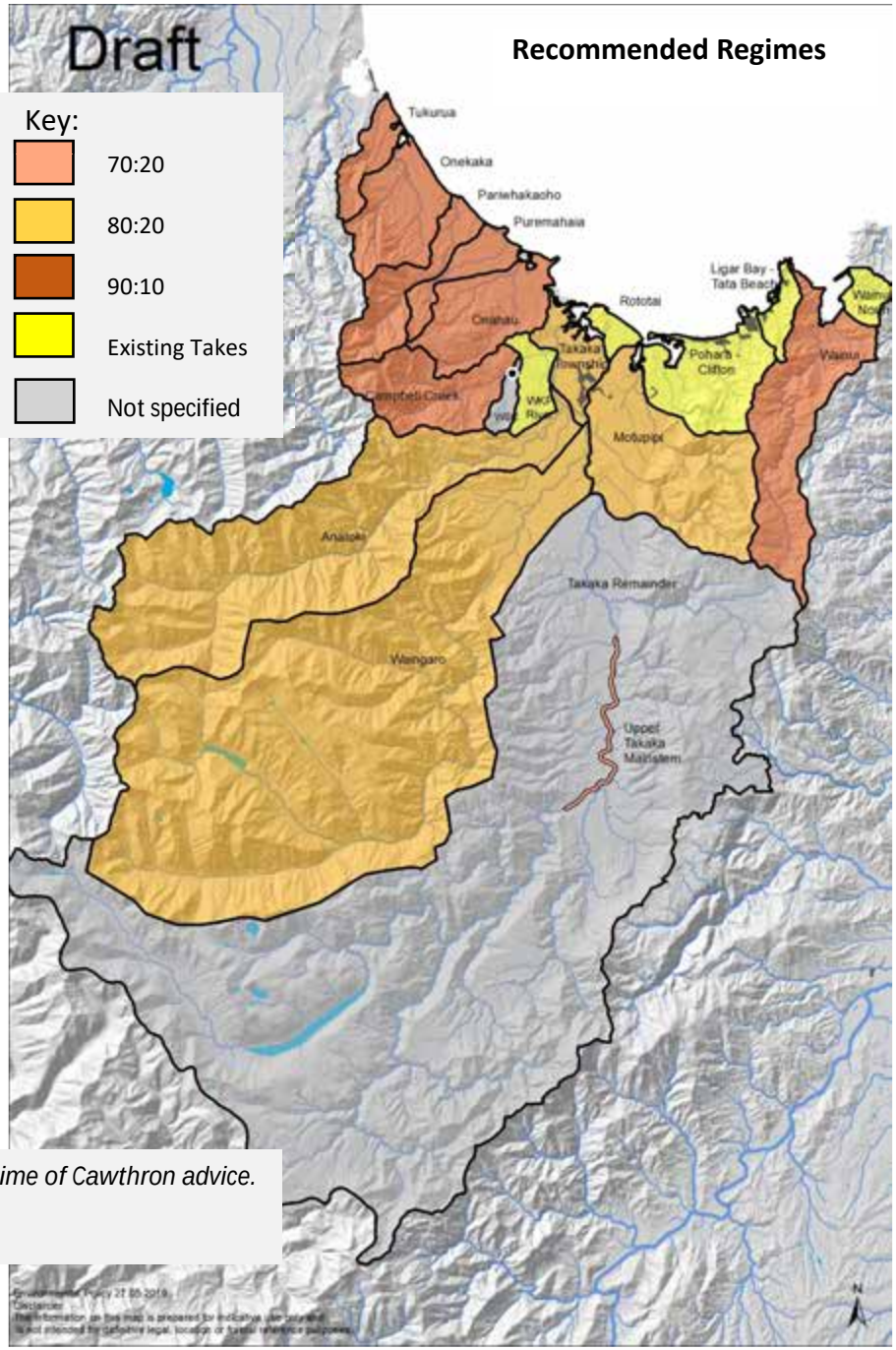
[65] Refer references in section 4.3 of Cawthron Report 2977 (2017)

identified in the recommended regimes range between 70% and 90% of MALF and allocation limits between 10 and 20% of MALF (refer Figure 8, based on Table 1 of Cawthron, January 2017).

Note on allocation regime naming – from here on regimes are referred to by their minimum flow and allocation limit percentages of MALF, for example a 90:10 regime has a minimum flow at 90% of MALF and an allocation limit at 10% of MALF.

Figure 8 Ecological Significance (mapped from zone summary (Table 1) in Cawthron Report 2977) and corresponding recommended regime application





Note: mapped using zone boundaries at time of Cawthron advice.
WSC = Waikoropupū Surface Catchments
WKP = Waikoropupū

10.6.4 Rivers which lose water to groundwater

For zones that lose water to groundwater, consideration is given to the location of minimum flow measurement. In situations where there are flow monitoring sites both upstream and downstream of abstraction, the allocation limit uses the MALF at the lower monitoring site (below the abstraction), while the minimum flow uses the MALF at the upper monitoring site (above abstraction). This is considered a more conservative approach than using just the upstream site, and ensures the allocation limits consider the impact of groundwater losses in the lower reaches and help ensure the minimum flow is maintained for the entire waterbody.

10.6.5 Alternative methods for specific zones

In the groundwater zones and some surface zones with limited data on flows (and where MALF cannot be calculated) Dr Young and Joseph Thomas have assessed the effects of existing abstraction and recommended suitable allocation regimes. These are:

- **Groundwater Zones** (Motupipi (groundwater), Waikoropupū River and Rototai Zones), **and Surface zones with limited data** (Pohara/Clifton, Wainui North Zones)**:** the recommendation is to 'grandfather' the existing allocation amounts. For these zones, there would be no further water made available and the allocation limits would provide only for existing consented takes. In these zones, consents will still undergo bona fide review[66] and review of their potential environmental effects during consent renewal, as well as inclusion of cease take conditions (where appropriate) determined on a consent-by-consent basis (refer Section 10.10). The allocation limits for these zones should reflect the amounts consented following bona fide review.

- **Lower Arthur Marble Aquifer Zone:** The allocation for this zone has been based on an amount that is less than 1% of the estimated aquifer flow to the sea, as defined by the Stewart and Thomas hydrological model (refer reference in Thomas and Harvey 2013).

- **Ligar/Tata Bay Zone:** The streams in this zone are very small, with no existing consented takes or known demand, and no significant water resource available. Therefore the allocation has been set at zero.

We also sought advice from Dr Young, Joseph Thomas and Trevor James on the ecological risk and appropriateness of our alternative regimes where these have differed from the recommended regimes (due to considerations for other values and uses of water). These alternative regimes are outlined in Section 10.9 and Appendix 16.5.

Further written advice included:

- Lower Tākaka Water Allocation Limit Options, Cawthron Letter, 28 July 2017
- Wainui Zone Water Allocation, Wainui North Zone Water Allocation, and Implementation Of Rationing Steps And Cease Take Flows, Cawthron Letter, 21 November 2017

10.7 Rationing and cease take

A significant component of sustainable flow regime management is the use of cease take triggers to stop consumptive water takes at low flows and avoid river flows being drawn below the minimum flow.

[66] This is a review of the actual water used over a previous time period (eg 5-10 years)

Once rivers reach the cease take triggers, consented consumptive water takes are stopped and no longer impact flow levels. Any further reductions in river flow during drought will be through the natural flow recession processes – ie rivers will still drop below the minimum flow naturally during prolonged droughts.

Currently, only seven of 78 consented consumptive water takes in the Tākaka FMU have flow related cease take triggers as part of their consent conditions (3 in Upper Tākaka, 1 at Waitui, 1 in Onekaka, 2 in Elllis Creek). Having cease takes for all consented consumptive water takes that affect minimum flows, in all zones, will improve the protection of instream ecological values during periods of low flow. However, the new cease takes will reduce the security of supply for existing consent holders, as rationing and cease takes are currently made during droughts by the Dry Weather Task Force at flow levels lower than the proposed cease takes.

Cease take provisions should not apply in the following situations:

- Non-consumptive takes, such as hydro-electric power generation, where the water taken is returned to the same water body after use
- Takes from storage (i.e. where the storage is filled during high flow times and taken for use during low flow times)
- Consumptive takes from groundwater resources where there is abundant water and abstraction does not affect surface water body flows or groundwater levels[67]
- Consented community water supplies - as basic water requirements for maintenance of public health are afforded the highest priority through the TRMP[68].
- Small domestic water takes and stock water supplies, which are permitted in the TRMP (refer TRMP 31.1.2.1) and do not require resource consent (the RMA section 14-3-b requires that these takes do not have an adverse effect on the environment – refer Section 12).

Cease take to avoid salt intrusion into aquifers are applied to groundwater takes within the Coastal Margin Zone.

A pressure based cease take applies for any takes from the confined part of the Arthur Marble Aquifer to protect artesian flows at Te Waikoropupū springs.

We acknowledge the Council also has powers under Sec 329 of the RMA 1991 to issue water shortage directions for any takes (including community water supplies and permitted takes) and any discharges to water, in order to manage the use of water and rationing or cease take during serious temporary water shortages and to protect water resources.

10.7.1.1 Calculating cease take triggers

Cease take triggers are calculated by one of two methods depending on whether the flow monitoring site is above or below the location of the water takes – namely:

- Flow site above: Cease take = Minimum flow + Allocation Limit

[67] These takes are still managed within the zone allocation limits.

[68] Water for maintenance of public health is a priority use under the TRMP (policy 30.2.3.1) and as such, domestic and community water supplies are not normally subject to cease take. During drought, restrictions are placed on the kinds of domestic use, for example excluding watering of amenity plantings. However, the use of water will not usually be ceased entirely, unless this is warranted to avoid long-term damage to water sources (for example to avoid saltwater intrusion into an aquifer). Such cease takes are implemented through powers afforded to Council under section 329 of the RMA, rather than through the TRMP.

- Flow site below: Cease take = Minimum flow

(Refer to Appendix 16.6.3 for further explanation).

The exception to this is the Waikoropupū Springs cease take, which uses minimum flow plus the allocation, despite the monitoring site being below the takes. This is to provide an added level of conservativeness to this cease take.

For most zones in the FMU the cease take calcuation results in a cease take at MALF, for example:

- 90:10 regime cease take is at 100% of MALF
- 80:20 regime cease take is at 100% of MALF
- 80:10 regime cease takes is at 90% of MALF
- 70:15 regime cease take is at 85% of MALF

10.7.2 Rationing

Rationing steps are used to incrementally reduce water usage, enabling water users to have access to part of their allocation when flows are getting low, but reducing how quickly minimum flow is reached. This approach reduces the environmental impact of takes during lower flows, while also avoiding or reducing the economic and social impacts of cease takes.

Regimes with rationing steps and cease take still protect the same minimum flow level.

Rationing can only be used where river flow recessions allow for this – i.e. when river levels drop relatively slowly during dry periods. A single rationing step of a 50% cut in consented takes has been identified as a viable option for the Anatoki, Waingaro, Motupipi and Tākaka Township Zones (refer Table 8).

10.7.3 Restart triggers

Once cease take occurs, takes can be restarted when there is sufficient rainfall to restore river flows. Restart triggers are identified for each zone that has cease takes, using one of two methods:

- When the 1-day running average equals the Cease Take trigger, or
- When flows reach the Cease Take (instantaneous)

Most zones use the 1-day running average method. Cease takes based on pressure or salinity are instantaneous and the Upper Tākaka Mainstem zone is instantaneous as users in this zone have installed telemetered infrastructure to enable use of the on-off nature of Cobb dam water releases.

10.7.4 Practical implementation of rationing, cease take and restart triggers

It is important that implementation of the rationing and cease take triggers is practical. Water permit holders need to easily know when they are in rationing or cease take periods, and Council needs to be able to reliably audit water use to ensure water is only taken at appropriate times.

While media releases are typically made for the implementation of rationing and cease take, water users need to have more immediate knowledge of the status of their local water resource, compared to the requirements of their water permits, for contingency planning and actioning water rationing or cease take. For rivers and groundwaters that have telemetered flow/level gauges, this information will be readily available to view online on Council's website. For sites that do not have a telemetered flow/level gauge, work has been undertaken by Council staff to correlate those river flows to either a telemetered flow gauging site on a larger river (ie Anatoki

River at Happy Sams), or in some cases to a water level in a nearby groundwater bore. (eg the firestation bore for the Motupipi River or the monitoring bore for Waikoropupū Springs). This will mean that water permit holders will be able to use online flow data to know when their respective rivers are approaching or entering rationing or cease take.

In addition, the timing for application of rationing or cease takes (or restarts) needs to take into account the practical realities of how water take systems typically function (ie manual switch off), and the water metering process Council uses to manage and audit water takes.

Council staff have identified a practical process as being: online release of MALF information at 9am each day during water short periods, with action by permit holders for rationing, cease take or restart to be implemented by 12pm on the same day. Where flows reach triggers after the 9am release of MALF information (eg in the afternoon or overnight), there is a short delay in response, as this would be captured in the process the following day. Council would then assess individual metering results to ensure actions were taken by permit holders at the appropriate time to confirm compliance.

10.8 Security of supply

Once the minimum flow, allocation limit and cease take triggers are defined, the security of supply for the regime can be determined.

Security of supply is a measure of how reliable a water take is.

Security of supply is a measure of how reliable a water take is. In FLAG discussions of what reliable meant, it became clear that it was not only important how often water takes were ceased, but also for how long each cease take would apply. A cease take period longer than 3 to 5 days at critical times was considered to be restrictive for pastoral irrigation uses.

The critical period for water use will be different for different productive uses (ie different crops) depending on their water needs at different points in their growing cycle. Typically cease takes occur in the drier months from December to March.

We used several metrics to describe and consider the security of supply. These have compared the proposed regimes to the historic flow record for each river and determined:

1) *Between November to April - the percentage of time that rivers flowed above the cease take trigger*
2) *The number of years that would have had cease takes longer than 3 days and the number of these events occurring*
3) *The number of years that would have had cease takes longer than 5 days and the number of these events occurring*

For many catchments in Tākaka, water supply is reliable most of the time, but in particularly dry times, when cease takes do occur they are likely to be for extended periods at a time (i.e. infrequent, but relatively long cease takes occur). The consequence for those reliant on a high supply security is that they may need to install water storage, find alternative supplies or change management practices when longer cease takes apply.

Most of our considerations on security of supply focused on the major rivers with existing irrigation demand, and looked at 16 to 17 years of historic data between 1999/00 and 2016/17. The relative security of supply calculations for each zone are expected to be updated for the Tākaka FMU in July 2019, enabling the severe drought within the 2018-19 hydrologic year to be included in

calculations. Further work on the likely seasonal timing of cease takes may also assist water users in understanding the effect on security at key times for differing production uses.

FLAG recommendation 7 highlights that Council needs to confirm the acceptability of the security of supplies in each zone with stakeholders, to determine if allocation limits need to be reduced to improve security.

While review of historic data provides an indication of likely future security of supplies, the potential impacts of climate change introduce uncertainty into future security and suggest a need for building resilience into both water and land use management in the FMU. Use of water harvest (at times of higher flows) and off-stream storage may be required to maintain security levels over time.

10.9 Further considerations for other values and uses of water by FLAG

10.9.1 Consensus changes to allocation regimes for Upper Tākaka and Pariwhakaoho zones

We have assessed the recommended regimes against the values of water and management objectives, and made further amendments to provide for Cultural and Spiritual values (ie Pariwhakaoho Zone) and Livelihood and Economic values, regarding security of supply and recognition of existing investment (ie Upper Tākaka Mainstem zone). These changes are summarised below:

Table 6 Summary of FLAG amendments to recommended allocation regimes

Zone	Recommended regime	Amended regime	Reasons
Pariwhakaoho	90:10 Surface and groundwater combined zone	90:10 Groundwater zone only	Protection of Cultural and Spiritual values, as this is an ancestral awa; many local iwi whakapapa to the Pariwhakaoho River and takes directly from the river should be avoided to protect its mauri and wairua. This also considers that groundwater is preferred by users as the flashy nature of the river damages surface take infrastructure, so provision of groundwater allocation is unlikely to disadvantage users.
Upper Tākaka Mainstem	70:20	70:15 Plus use of A and B class takes, with existing consents as A class and new takes as B class.	Protection of Livelihood and Economic values - the use of class A takes protects the status quo for existing users. This recognises that the existing consents already have cease takes to protect river flows, and users have invested in specific infrastructure to efficiently utilise releases from the Cobb dam. The reduced allocation limit improves the security of supply for B class takes.

Our recommendations for allocation regimes that have differed from those recommended by Cawthron and Council's scientists, have used alternative values that are more ecologically conservative.

FLAG recommendation 13:
That the Council adopts the modifications by FLAG, to the Cawthron recommended allocation regimes, in the Pariwhakaoho and Upper Tākaka Mainstem Zones, that incorporate further provision for Cultural and Spiritual, and Livelihood and Economic values of water.

10.9.2 Non-consensus changes to allocation regimes for Anatoki and Arthur Marble Aquifer Recharge zones

We have identified options to address concerns around levels of risk to ecosystem health in the context of reduced demand in the Anatoki Zone, and levels of risk and conservativeness in the Arthur Marble Aquifer Recharge Zone, but we did not reach consensus on these.

The options identified in each zone are summarised in Table 7. We have provided reasons for each of the options for a decision by Council (refer Appendix 16.6.4 and 16.6.5) - noting that decisions in the Arthur Marble Aquifer Recharge Zone will be influenced by the outcome of the Water Conservation Order process.

Table 7 FLAG options for non-consensus amendments to recommended allocation regimes

Zone	Recommended regime	Alternative regimes	
Anatoki	**80:20 (not selected)** Minimum flow 80% of MALF Allocation limit 20% of MALF	**Option 1: 90:10** Minimum flow 90% of MALF Allocation limit 10% of MALF	**Option 2: 80:10** Minimum flow 80% of MALF Allocation limit 10% of MALF
Arthur Marble Aquifer Recharge	**Option 1: 90:10** Minimum flow 90% of MALF Allocation limit 10% of MALF	**Option 2: Stepped Allocation** Minimum flow 90% of MALF Allocation limit 5.3 to 10% of MALF (transition from 90:5.3 to 90:10 regime over time depending on water quality at springs)	**Option 3: No additional water** Minimum flow 90% of MALF Allocation limit 5.3% of MALF (equivalent to a 90:5.3 regime)

The complexity of water connections in the Tākaka FMU means that both of these decisions have flow-on effects to other zones. The Anatoki options have taken into consideration effects on water availability in the Tākaka Township Zone, as that zone must take account of allocation limits in upstream areas. The Arthur Marble Aquifer Recharge Zone affects the contributing zones of Upper Tākaka Mainstem, Waingaro, Tākaka Remainder and Lower Arthur Marble Aquifer Zones as the individual allocation limits for these zones are also accounted for within the Arthur Marble Aquifer Recharge Zone (refer Appendix 16.6.6).

FLAG recommendation 14:
For the Anatoki and Arthur Marble Aquifer Recharge zones, where FLAG did not achieve consensus on a final allocation regime, that the Council consider FLAG's preferred options and reasons for the options identified for each zone, and decide on the option to incorporate in the Tākaka Freshwater Plan Change.

10.9.3 Waikoropupū exclusion zone

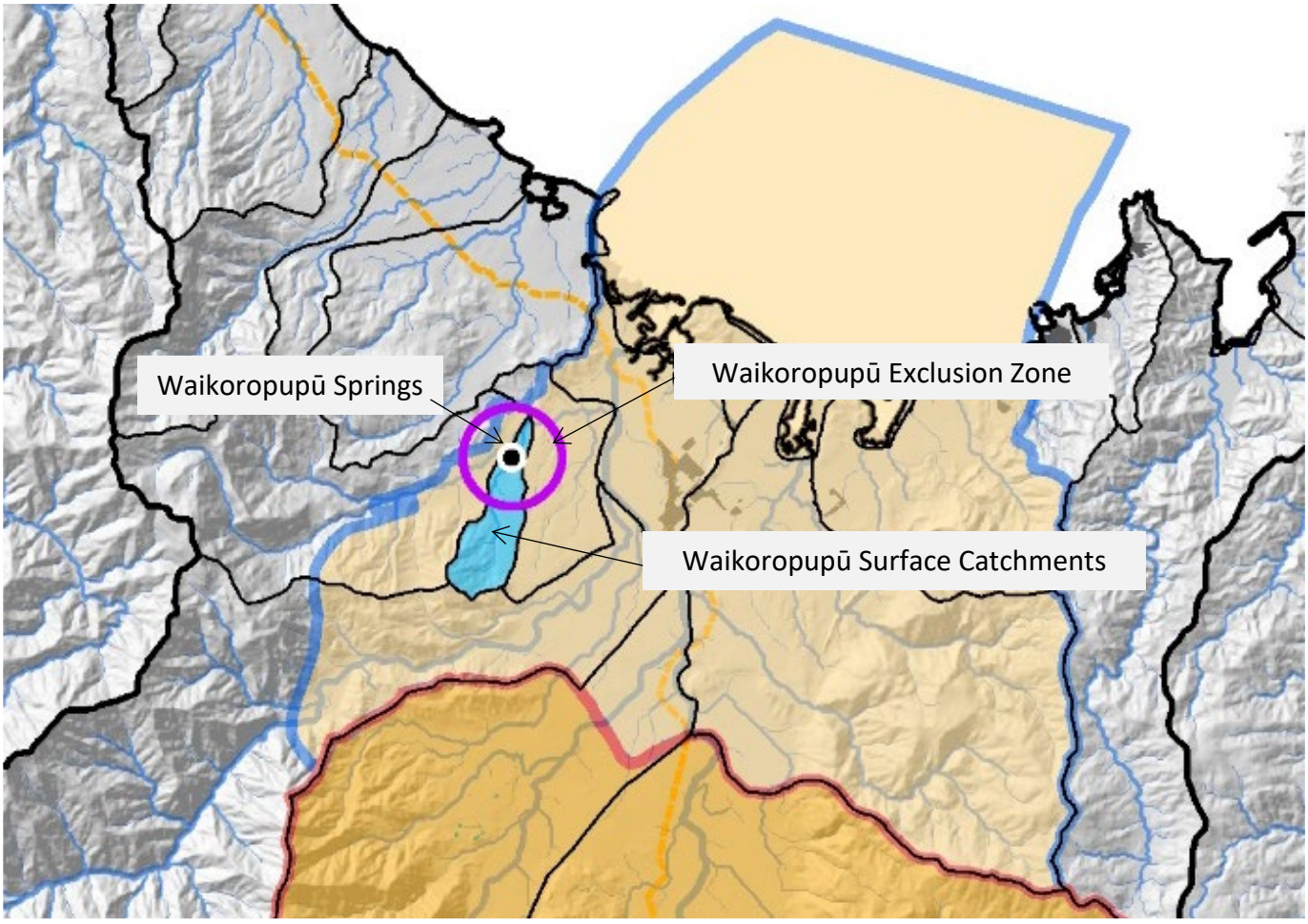
This is a one kilometre zone surrounding Te Waikoropupū springs (refer Figure 9). This zone is an exclusion zone, rather than an allocation zone. It excludes new bores and new groundwater takes from the Arthur Marble Aquifer in close proximity to the springs. The intent of this zone is to

protect the mauri of the springs. The 1km distance does not have a science basis, but is supported by MKM as a suitable separation distance from the springs.

There are two bores, but no consented consumptive takes from the Arthur Marble Aquifer in this zone. The Council operates a monitoring bore adjacent to the springs and this is intended to continue for assessment of water flow and quality.

FLAG recommendation 15:
That the Council adopts, and incorporates in the Tākaka Freshwater Plan Change, the proposed **Waikoropupū Exclusion Zone** around Te Waikoropupū main spring, to ensure no new bores and no new water takes occur from the Arthur Marble Aquifer within one kilometre of Te Waikoropupū main spring.

Figure 9 Waikoropupū Exclusion Zone and Surface Catchments Zone



10.9.4 Waikoropupū surface catchments

This zone (refer Figure 9) was separated out from the Campbell Creek and Waikoropupū River zones as this area drains into water bodies within the Te Waikoropupū Scenic reserve, and it was not appropriate that this area be part of the allocation regimes for the other zones.

The zone primarily covers the Fish Creek catchment. There are two existing bores, but no existing consented consumptive takes[69], however there are some permitted takes (each less than 5m^3 per

[69] Council operates a monitoring bore adjacent to the main spring.

day) and stockwater and dairy shed takes further up the catchment. There are limited water resources available in the upper Fish Creek area in summer, and Fish Creek frequently dries up over summer in the lower reach just above the Waikoropupū reserve boundary. Both FLAG and MKM have identified that there should be no abstractive takes from the waterbodies within the Waikoropupū reserve.

Given the limited nature of the water resource in this zone and the desire to protect Fish Creek and Waikoropupū, there should be no new consented takes allowed in this zone. However, Council staff advised us that an allocation limit should be set in this zone to provide for the existing permitted takes, but that at the time of writing, insufficient information is held by Council on flows and permitted takes in the upper Fish Creek to set a limit. Investigation of this is required to enable an assessment of potential for adverse effects on Fish Creek, including the reach where the current permitted takes are located. Many of the takes have existed for some time, including the take for the Department of Conservation washbasins and toilets in the reserve carpark.

This zone has also been identified as a priority for restoration of water body health. Significant work has been undertaken by the Department of Conservation for waterbodies in the reserve and ideally this should continue for the reaches of Fish Creek that are outside the reserve. FLAG have discussed implementation of this through both regulatory and non-regulatory support of current restoration efforts by landowners (refer Section 11.4.1).

FLAG recommendation 16:
That the Council adopts the proposed **Waikoropupū Surface Catchments Zone** and:

a) Instructs staff to investigate flows in the upper catchment and the permitted takes occurring in the catchment to inform the setting of a suitable allocation limit for the zone;
b) Identifies Fish Creek as a priority catchment for waterbody restoration;
c) Supports land owners through provision of advice and financial measures to achieve the desired waterbody restoration and water quality goals in Fish Creek in a timely manner.

10.9.5 Reservation of water for community supply

We recognise the need to ensure there is sufficient water available within the allocation limits for community water supply, if desired by the community in the future. Further, we wish to ensure water used for existing community water supplies is also reserved for this use[70] .

The amounts of water reserved for community water supply are set aside within the allocation limits identified in each zone. This reserved water can be used for other uses for short periods if it is not immediately required for community supply, but the reservation protects this part of the allocation over the long term. Council staff have estimated a reservation amount for the Tākaka Township zone of 80 l/s, and can confirm the amounts of water used in each zone for community supplies from current consents.

FLAG recommendation 17:
That the Council instruct staff to include reservation for community water supply in the Tākaka Freshwater Plan Change for:

a) the Tākaka Township Zone, and
b) all other zones equivalent to the existing consented amount for community water supplies.

[70] This is consistent with current TRMP policy on reservation of water for community supplies.

10.9.6 Tākaka waiting list for water

There is an informal waiting list for new water takes in the Tākaka and Waingaro catchments, which are within the Arthur Marble Recharge area. As of April 2019, there are 11 entries in the waiting list. Staff have advised FLAG that the waiting list should be formalised to ensure it operates as intended for any new water take applications in these zones (within the respective allocation limits) and we agree with this advice.

FLAG recommendation 18:
That the Council instruct staff to formalise the Tākaka Waiting List for water in the Tākaka Freshwater Plan Change.

10.10 Addressing potential over-allocation

Following definition of ecologically sustainable allocation limits by Cawthron and FLAG's further amendments, all zones[71], with the exception of Tukurua, are currently under or fully allocated regarding the current cumulative consented amount compared to the proposed allocation limit.

In the Tukurua Zone, the current amount of water allocated in consents is slightly higher than the proposed allocation limit. However, upon investigation the main permit in this zone is a community water supply, which includes both a consumptive and non-consumptive part to the water take. It is expected that upon consent renewal, the exclusion of the non-consumptive part will remove the 'on-paper' over allocation in this zone. It is noted that as a community water supply this consent would not be subject to the proposed cease take.

In addition, a further localised potential over-allocation was identified in the Anatimo sub-catchment. This take is within the allocation limit proposed for the Wainui zone, but concern was raised over the potential effect on the Anatimo Stream due to the volume of the water take relative to the small flow. FLAG agreed that this should be addressed as part of the consent renewal process, as advice from Dr Young was that specific investigation is required to understand the localise impact of the take.

We have also considered the issue of takes on tributaries within zone regimes - see section 10.11 below.

FLAG recommendation 19:
That for the 2019 Tākaka water permit renewal process the Council direct staff to:

a) ensure that any potential 'on-paper' over allocation identified (including examples in the Tukurua and Anatimo catchments) is addressed;
b) consider:
    i. bona fide review,
    ii. inclusion of a consent review condition subject to policy directions from notified Tākaka Freshwater Plan Change,
    iii. use of interim cease takes to protect minimum flows using existing TRMP polices; and
c) consider suitable consent conditions to protect low flows in catchments where there is no hydrological flow data to inform an allocation regime and where allocated amounts have been grandfathered.

[71] Ligar Bay – Tata Zone is excluded as it has an allocation limit of zero l/s.

10.11 Avoiding over-allocation

10.11.1 Management of tributaries and adjacent waterbodies

The zones, and their respective water allocation and quality regimes, apply to all waterbodies within them – both surface and groundwater (as applicable). Any allocation regimes, including allocation limits and rationing or cease takes also apply to any takes from tributaries or smaller creeks and streams within the zone. The aim of the recommendation is that all waterbodies in a zone are protected to the same level.

FLAG recommendation 20:
That the Council adopts a policy in considering new water take applications, of protecting tributaries to the same extent as the main river from which the zone allocation regimes are derived to avoid cumulative effects of water takes on the ecological health of tributaries. For example, in zones with a 90:10 regime, tributaries in the same zone are also protected relative to their own low flows to an equivalent 90:10 level.

10.11.2 Activity status for water take applications above allocation limits

The current activity status for takes above allocation limits is non-complying. We discussed the option of making this a prohibited activity. While prohibited status would protect the allocation limits defined by FLAG until the next plan review, members are concerned with potential unintended consequences of this approach, and consider this needs further consideration by Council during the drafting of the proposed Tākaka Freshwater Plan Change.

FLAG recommendation 21:
That the Council:

a) instructs staff to consider the implications of applying a prohibited activity status to water take applications above allocation limits, during the development of the Tākaka Freshwater Plan Change, and
b) If appropriate, include a prohibited status in the plan change to protect the allocation limits identified in each zone. Otherwise retain the non-complying status.

10.12 Summary of selected allocation regimes

Table 8 outlines the selected allocation regime minimum flows/levels, allocation limits, available water, and rationing and cease take triggers for each zone in the Tākaka FMU (refer also Appendix 16.5 for further explanation of the options for the Anatoki and Arthur Marble Aquifer Recharge zones).

Figure 10 shows a graph of the allocation limits in each zone, including existing use (currently consented amounts) and additional water that would become available for use under the proposed allocation limit (including options in the Arthur Marble Aquifer Recharge and Anatoki Zones).

The Figure 10 inset pie chart shows the total allocated limit (amount of water potentially available for extractive use) for the FMU. The orange segments show the difference in total allocation under the options for the Arthur Marble Aquifer Recharge Zone - the darker orange being the minimum additional water (with no more water in the AMA Recharge under Option 2), and the lighter orange showing the further additional water under Option 1.

The total allocation limit for the Tākaka FMU differs depending on the option selected under the Arthur Marble Aquifer Recharge Zone[72]:

- Total FMU allocation limit (with Option 1): 2231 l/s
- Total FMU allocation limit (with Option 2): 1685 l/s

The total amount currently consented in the FMU is 1254 l/s.

This equates to an increase in the water available for use (refer Figure 10 inset) of:

- Total FMU additional water (with Option 1): 982 l/s - or a 78% increase
- Total FMU allocation limit (with Option 2): 436 l/s – or a 35% increase

As covered in FLAG recommendations 12, 13 and 14, for zones where we have achieved consensus decisions on allocation regimes (all zones except Anatoki and Arthur Marble Aquifer Recharge Zones), we want the Council to adopt the allocation regimes as set out in Table 8. This includes minimum flows, allocation limits, rationing and cease take triggers and restart triggers; and include these in the Tākaka Freshwater Plan Change.

[72] The limit in the Anatoki Zone does not affect this as it is the same for both its options. The total FMU calculations use the contributing catchment limits based on the effect of the AMA Recharge zone option to avoid double counting.

Table 8 Summary of Allocation Regimes for the Tākaka Freshwater Management Unit

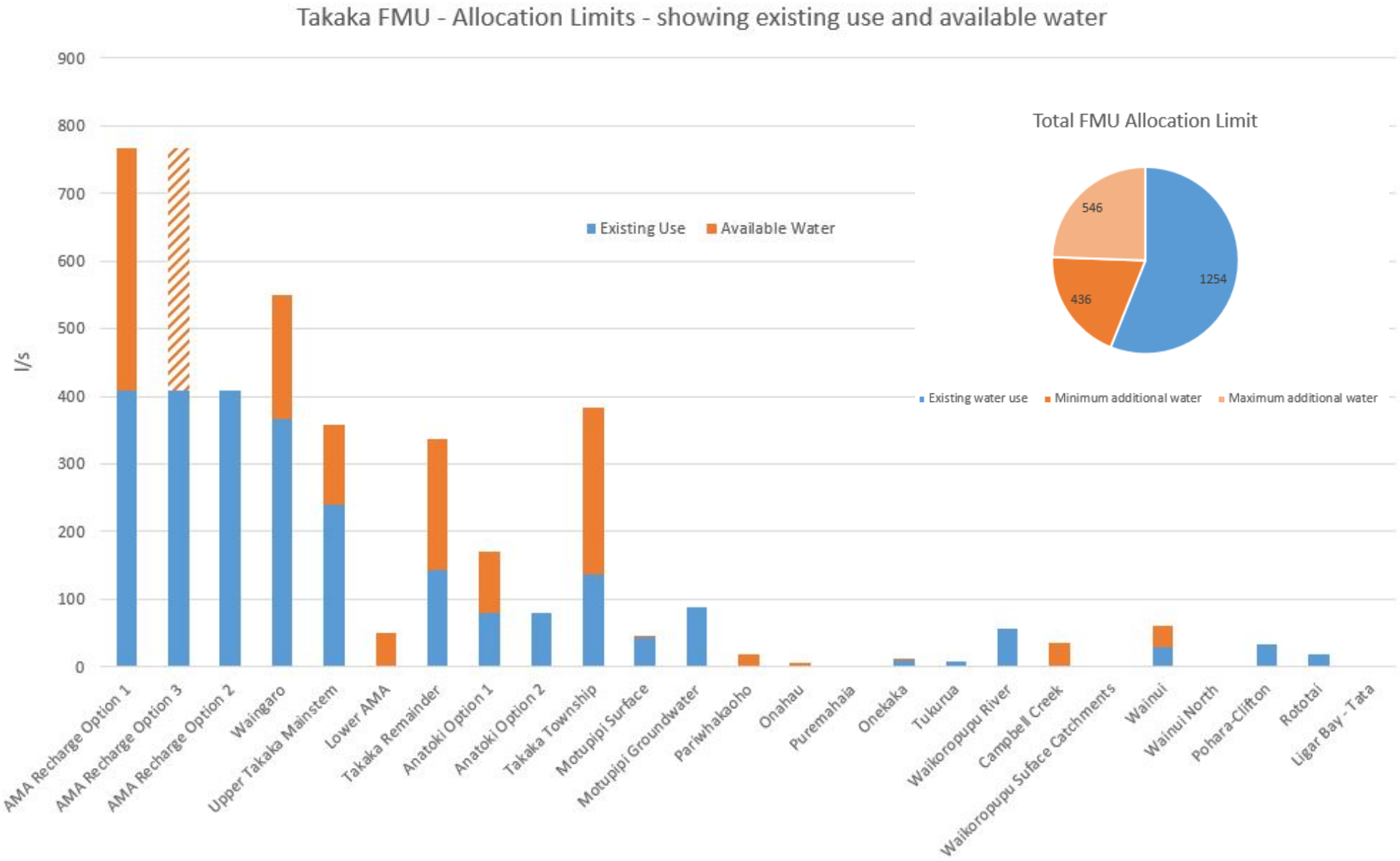
Zone		Selected Regime	Minimum flow (l/s) or level	Allocation Limit (L/s)	Additional Water Available[73] (L/s)	Cease Take Triggers	Comments
Arthur Marble Aquifer (AMA) Recharge (No FLAG consensus: 3 options defined)[74]		90:10	6895	766	358	*Refer triggers in Waingaro, Upper Tākaka, Tākaka remainder & Lower AMA*	*No FLAG consensus – Council to make decision on options. These numbers subject to change by Water Conservation Order process.*
		90:5.3	6895	408	0		
		Stepped	6895	408 to 766	0 increasing to 358		
Waingaro		**80:20**	Confluence: 2200 Hanging Rock: 2868	550	184	*Rationing: 3418* *Cease Take: 3143*	*These numbers dependent on decision for AMA Recharge zone and subject to change by Water Conservation Order process.*
Upper Tākaka *(main stem only)*		**70:15** (with A & B classes)	A takes: 1418 B takes: 1666	357	118	*A Cease Take: 1657* *B Cease Take: 2023*	*These numbers dependent on decision for AMA Recharge zone and subject to change by Water Conservation Order process.*
Lower Arthur Marble Aquifer		**50 L/s**	NA	50	50	*Cease Take: Aquifer pressure based*	*These numbers dependent on decision for AMA Recharge zone and subject to change by Water Conservation Order process.*
Tākaka Remainder		NA - based on AMA Recharge Zone	NA	Balance of AMA Recharge (up to 336)	Up to 194	*Cease Take: 7661 (at Waikoropupū main spring)*	*These numbers dependent on decision for AMA Recharge zone and subject to change by Water Conservation Order process.*
Anatoki (No FLAG consensus: 2 options defined)[75]		90:10	One Spec: 1536 Happy Sams: 1940	171	91	*Rationing: 2111* *Cease Take:2026*	*No FLAG consensus – Council to make decision on options.*
		80:10	One Spec:1366 Happy Sams: 1725	171	91	*Rationing: 1896* *Cease Take:1810*	
Tākaka Township		**80:20**	4417	383	166 + 80 reserved for community supply	*Rationing:4800* *Cease Take: 4609*	*These numbers are subject to the decisions made on the Anatoki and Waingaro regimes as this zone must account for allocation in upstream areas.*
Motupipi	*surface water*	**80:20**	185	46	2.8	*Rationing: 231* *Cease Take: 208*	*Triggers correlated to bore WWD6535.*
	groundwater	**Existing Takes**	NA	88	0	No cease take	*No cease take proposed due to high groundwater flows.*
Coastal Western Catchments	*Pariwhakaoho (groundwater)*	**90:10**	176	19	19	*Cease Take: 195*	*Allocation only for groundwater due to Cultural and Spiritual values. Triggers correlated to Anatoki flows.*
	Onahau	**90:10**	61	6	6	*Cease Take: 67*	*Triggers correlated to Anatoki flows.*
	Puremahaia	**90:10**	21	2	2	*Cease Take: 23*	*Triggers correlated to Anatoki flows.*
	Onekaka	**90:10**	104	11.6	1.7	*Cease Take: 116*	*Triggers correlated to Anatoki flows.*
	Tukurua	**90:10**	35	3.9	-3	*Cease Take: 39*	*The regime has an 'on-paper' over allocation that is anticipated to be resolved upon consent renewal. Triggers correlated to Anatoki flows.*
Waikoropupū Catchment	*Waikoropupū River*	**Existing takes**	NA	57.3	0	*No Cease Take*	*No cease take proposed due to high groundwater flows.*
	Campbell Creek	**90:10**	318	35	35	*Cease Take: 353*	
	Waikoropupū Surface Catchments	To be determined (refer Section 10.9.4)			0 (no water for consented takes)	*Not applicable*	*There is limited water resource and abstractive takes from the waterbodies within the Waikoropupū reserve are to be avoided. Only existing permitted takes are provided for.*
Wainui		**90:10**	552	61	31	*Cease Take: 613*	
Wainui North		**Existing takes**	No data	1.9	0	*Cease Take: consent specific*	
Pohara-Clifton		**Existing takes**	No data	32.9	0	*Cease Take: consent specific*	
Rototai		**Existing takes**	NA	19.2	0	*Cease Take: consent specific*	
Ligar Bay-Tata		**No allocation**	NA	0	0	*Not applicable*	*The streams in this zone are very small, with no existing consented takes or known demand, and no significant water resource.*
Coastal Margin Zone		**NA**	NA	NA	NA	*Cease Take: salinity based 0.4 millisiemens/cm*	*This zone overlaps other zones and applies to all groundwater takes (excluding AMA takes) within this zone.*
Waikoropupū Exclusion Zone		**NA**	NA	NA	NA	*NA*	*No new takes from the AMA are allowed within 1km of the Waikoropupū main spring*

[73] Derived from allocation limit less existing consented amounts. Note does not include consideration of reservations for community supply or consideration of future permitted takes. Cell shading shows: green = additional water available, orange = no additional water available, red = potentially over allocated (refer Section 10.11)

[74] Refer sections 10.9.2 and Appendix 16.6.5) Note red text in the table are values that may be affected by the decisions on the non-consensus options.

[75] Refer sections 10.9.2 and Appendix 16.6.4) Note red text in the table are values that may be affected by the decisions on the non-consensus options.

Figure 10 Tākaka FMU Allocation Limits – showing existing use and available water (including options for AMA Recharge and Anatoki Zones)



Note: This graph does not include flow-on effects to contributing zones for the options under the Arthur Marble Aquifer Recharge zone (refer Section 10.9.2)

11 Water Quality Framework

11.1 Overview

This section outlines our recommendations for management of water quality, including management of point and non-point (diffuse) source discharges[76] and management of riparian vegetation.

In managing water quality, we aim to:

- Maintain current water quality and improve it at problem spots
- Protect ecological values, assuming this will also protect other values and uses of water
- Protect the health of the freshwater bodies, and in doing so protect coastal waters
- Include specific management of catchment areas that may influence quality at Te Waikoropupū Springs
- Focus on land uses and practices that generate contaminants and minimise risks to water
- Ensure management controls or other responses are proportional to the risks
- Proceed with precaution where there is uncertainty, and enable responsive future management and adaptation, and monitor what is happening to inform this
- Improve water quality and health by encouraging restoration of aquatic and riparian habitat
- Support those already doing good things to improve water health in the catchment and encourage others to follow their lead.

The Tākaka catchments do not have the same significant water quality issues to address as some other areas of New Zealand, but we have very special freshwater places and good water quality to protect (refer Appendix 16.7.1 for discussion on the current state of water quality).

There are potential risks to water quality across the FMU, from both current and future land and water uses that we are seeking to manage (refer to further discussion on risks in Appendix 16.7.2).

Risks of concern include:

- Point and diffuse discharges of contaminants, in particular:
    - sediment
    - disease causing organisms (microbial pathogens from effluent and excreta)
    - nutrients, in particular nitrates and phosphorus that exacerbate algal growth
- Loss of aquatic and riparian habitat and the adverse effects on water quality from lack of shading (including impacts on temperature, dissolved oxygen and nuisance plant growth)
- Impacts on aquifer quality and function, potentially affecting quality at Te Waikoropupū springs

We understand that water quality is managed in the TRMP through:

- discharge rules covering a number of specific activities and point sources of discharges to land and water (eg domestic wastewater, dairy shed effluent, and stormwater)

[76] Contaminants from point sources enter the environment at well-defined locations in relatively predictable ways, while contaminants from non-point (diffuse) sources find their way into water in an uncontrolled and poorly defined manner. Non-point source contamination of surface water is particularly associated with run-off following rain events. Percolation to groundwater or subsurface flows to surface water are also pathways for non-point source contamination. Contaminants originally from point source discharges can contribute to diffuse contamination over time as they are transported through the environment.

- rules for land disturbance activities (with discharges from these covered under the discharge rules)
- rules on activities in river and lake beds that can directly affect water quality and waterbody health (eg structures, damming, planting, gravel extraction, and stock and vehicle access)

However, there are gaps in the current management regime:

- Not all point source discharges are adequately addressed with respect to risks to water
- Discharges from diffuse sources are not specifically managed – for example those potentially arising from stock faeces and urine onto pasture
- There are no controls on stocking density or land use intensification, where this may increase the risk of adverse impacts on water quality
- There are no controls on specific land use practices that pose high risk to water quality
- Controls on removal of riparian margin vegetation are limited, and do not focus on protection of water shading and bank stability, and subsequent effects on water quality
- There is no requirement for restoration of riparian vegetation where this has been lost
- The current controls do not provide specific protection to the Arthur Marble Aquifer recharge, which may affect quality at Te Waikoropupū.
- Provisions on contaminant discharges in the TRMP rely on a combination of water standards identified for classified waters, and protection of the values and uses of water identified in TRMP Schedule 30B. However, there is currently no content provided in Schedule 30B for the Tākaka FMU, and no classification of waters in the Tākaka FMU, except for that applying to the Coastal Marine Area[77]
- There are provisions for requirement of irrigation and nutrient management plans and nutrient allowances, but these sections are incomplete and not yet operative.

Below, we outline how we intend these gaps be addressed.

The values of water and associated management objectives we have defined (and freshwater objectives, once complete) are intended to replace any current values content[78] in the TRMP for the Tākaka FMU.

To address the other gaps, we discussed a number of potential approaches to water quality management, including:

- Management via allocation limits - to indirectly manage land use intensification
- Management via water permits – with conditions linked to good practice rule compliance
- Further management via discharge rules
- Management via land use, including regulation and non-regulatory approaches for:
    - Requiring and promoting good management practice
    - Managing land uses types and intensification – ie new conversions to higher risk activities, or intensification of existing activities
    - Riparian management, including protection and restoration of riparian vegetation

Management of water quality through both allocation limits and water permits does not account for water quality issues arising from land uses that do not use consented consumptive takes of water (ie 'dry' land uses). Some members of FLAG have been keen to utilise allocation limits as an indirect means to manage land use intensity - this is discussed further in Section 0.

[77] Refer TRMP schedule 36C.
[78] Refer TRMP schedules 30A and 30B

We have sought to manage diffuse discharges through managing the land use and practices that generate the contaminants of concern, rather than through further discharge rules. The approach focuses on what actions need to be taken on-farm to create improvements in water quality outcomes, rather than setting discharge limits for sediment, nitrate, or microbial pathogens, and leaving users to prove they are complying with these (refer Sections 11.2 and 11.3 and Appendix 16.7). We consider the land use focus is a more pragmatic approach that is easier to implement and monitor, particularly given the complexity of the water connections in the Tākaka FMU.

We recommend that, at a minimum, the following aspects are addressed in the Tākaka FMU as part of the freshwater plan change (1-4) and through non-regulatory methods (5-7):

1. **New land use rules that set minimum standards for all land uses:**
    a. Placing controls on maximum land use intensity in the FMU
    b. Requiring stock exclusion from waterbodies
    c. Requiring setback of activities and infrastructure from waterbodies and Te Waikoropupū reserve
    d. Requiring specific approaches to high risk practices, such as cultivation, and break-feeding or strip-grazing

2. **Focusing on diffuse discharges from moderate and high risk land uses:**
    a. Requiring good management practice through farm planning that assesses and addresses farm-specific risks to water,
    b. Use of an responsive approach to land use management in the recharge area for the Arthur Marble Aquifer (which may affect the water quality of Te Waikoropupū springs)

3. **Provisions protecting riparian vegetation, and promoting waterbody restoration:**
    a. More comprehensive rules protecting riparian vegetation from removal or destruction to provide for waterbody shading and habitat health
    b. Provisions to support waterbody restoration, including a 'backstop' rule[79] requiring implementation of riparian restoration plans by 2050

4. **Changes to point discharge rules:**
    a. Improved consistency of protection for karst sinkholes from point discharges
    b. Improved consistency of protection for Te Waikoropupū from point discharges

5. **Further investigations into water quality risks**
    a. Auditing of onsite wastewater in the FMU, particularly in areas overlying unconfined parts of the Tākaka aquifers

6. **Monitoring of new attributes and sites** to determine if freshwater objectives are met and values of water are provided for

7. **Education, advocacy, and financial measures** (where appropriate) to:
    a. assist landowners to achieve stock exclusion

[79] A backstop rule is a rule that applies at a date in the future (often after a significant period allowing for voluntary action) that signals a specific activity will be required to be undertaken by, or from the specified date. It is a means to bring any stragglers up to the same level as other users.

b. assist landowners and the community in achieving waterbody restoration
c. ensure effective design, operation and maintenance of onsite wastewater systems

11.2 Minimum standards to be met by all land uses

We recommend all land uses meet some minimum standards to minimise risks to water, managed by new TRMP land use rules. This recognises that even on small or low intensity sites, certain activities or poor practice can still generate significant adverse effects on water quality[80].

The minimum standards identified include:

- A maximum land use intensity (for stock or cropping)
- Stock exclusion from waterbodies to avoid faecal contamination and bed and bank damage, including to riparian vegetation
- Setbacks from waterbodies for high risk practices and infrastructure that may discharge contaminants – such as silage pits, feed pads, refuse pits, water troughs, etc - to enable sufficient distance for filtration or interception of contaminant discharges should they occur
- Specific practice standards – so that certain high risk activities, such as cultivation or break feeding or strip grazing, are undertaken in ways that minimise risk.

We consider these to be minimum good practice standards that everyone should be meeting. However, we highlight further discussion is needed to refine the standards, particularly what constitutes unacceptable land use intensity.

Many farmers in the Tākaka FMU are already operating at good practice to avoid adverse effects from their activities, and the implementing of minimum standards is unlikely to require further action from them. The rules are needed to ensure that *all* land users who are undertaking activities that can adversely affect water quality are operating at least at good practice to avoid or minimise those effects.

We consider a clear 'bottom line' rule can effectively manage these practices in the cases where this is not being achieved through personal choice – this view has been supported in discussions with Tākaka farmers.

FLAG would like to understand better what motivates certain landowners to invest voluntarily in practices that have beneficial outcomes for the environment, whilst others choose not to. If this could be better understood, and the behaviours achieved through personal choice based on best practice farming and land use principles, rather than regulation, then FLAG would not see the need for a regulatory approach. In the meantime, for these higher-risk activities, behaviour change is required and regulation will be the most efficient approach to incentivise the necessary changes in practices.

The proposed minimum standards are outlined further in the following sections.

[80] There are examples in the FMU where just a few malfunctioning septic tanks, or a single stock water trough too close to the river, can be enough to make water downstream unsuitable for swimming.

11.2.1 Controls on land use intensification

FLAG recommendation 22:
That the Council:

a) adopt in principle the regulatory management of land use intensification in the Tākaka Freshwater Management Unit; and
b) instruct staff to develop new provisions, in discussion with industry and stakeholders, in the Tākaka Freshwater Plan Change that manage land use intensity to avoid very high risk land uses, such as high intensity stocking or cropping and feed-lots in the Tākaka Freshwater Management Unit.

Public feedback has highlighted that there is anxiety about the possibility of increasing water allocation leading to increasing intensification, which could lead to a decline in water quality. Some FLAG members are keen[81] to use allocation limits to indirectly control the risk of land use intensification, particularly in the Arthur Marble Aquifer Recharge Zone – this is reflected in the allocation options proposed (refer Section 16.6.5). Council staff advice has been that if intensification is a key concern, it should be addressed directly, with a rule that controls land use intensification, particularly as some land uses can be intensified without water use[82].

Land use intensification can include both an increase in the intensity of existing land uses, and changes to land use with higher risk (eg the conversion of beef and sheep farms to dairy).

The message we have received from the local dairy industry is that water for irrigation is sought primarily to provide security for pasture growth over the dry summer months, rather than to increase stocking densities. This avoids the need to bring in costly supplementary feed to maintain milk productivity over this time, and enables farms to produce grass-fed milk. Water takes for irrigation results in conversion of dry dairy to irrigated dairy, which is estimated to be an increase in productivity equivalent to approximately 0.4 cows per hectare, or a 9 kg/ha potential nitrate loss[83].

In the whole Tākaka catchment, there are 533 hectares on the waiting list[84] to be irrigated (currently already dairy) with 469ha of these within the Arthur Marble Aquifer recharge area[85]. This represents an additional 213 Cows, or a 4% increase in overall cow numbers across the catchment[81].

There is potential for conversion of other land use (eg sheep and beef to dairy). For the whole catchment, this has been estimated at 494ha of 'plausible' irrigable land[86], and 1347ha of unlikely but potentially irrigable land. This gives a worst-case total of 1,841ha of land, or a further 104% of the existing irrigated area. The potential effects of this scenario ('double irrigation') were considered in the groundwater modelling report (Aqualinc 2017), which identified this scenario resulted in a modelled change in nitrate-nitrogen at Te Waikoropupū main spring from 0.42 to 0.47 g/m^3 (refer also Section 16.4.4).

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[81] 4 of 12 members
[82] For example using supplementary feed, rather than irrigation to increase productivity
[83] Pers.com Mirka Langford, May 2015 – from estimates of Fonterra Overseer records.
[84] Based on 533ha on the waiting list for water (refer also Aqualinc 2017)
[85] Refer Fenemor 2018
[86] 'Proposed irrigation' corresponds to potentially irrigable land represented by Council's waiting list for irrigation water permits. 'Plausible irrigation' represents potentially irrigable land meeting the criteria (ie topography, land suitability for irrigation, access to water sources, and land ownership), but not on TDC's waiting list. 'Unlikely irrigation' represents potentially irrigable land, but one or more of the criteria mean that this land would be unlikely to be irrigated in the medium term.

Most members[87] are keen to see a limit on land use intensification to minimise risk in all areas of the FMU, and in particular to avoid high stocking rates, such as those seen elsewhere in the country.

However, some FLAG members have significant concerns that the definition of intensification should only capture changes to land uses that represent a significant increase in risk over current use, and should not capture changes made that are a normal part of stock and crop management. For example the fluctuations in stock numbers that occur with seasonal changes to pasture management or stock breeding programs, and changes to cropping rotations for soil and disease management.

Determination of a suitable definition for 'intensification' needs to be undertaken by Council in conjunction with industry and stakeholders, including consideration of what constitutes a significant change in land use that increases the risk in the Arthur Marble Aquifer Recharge Zone to levels that require additional control.

11.2.2 Stock exclusion

FLAG recommendation 23:

That the Council, for the Tākaka Freshwater Management Unit:

a) instruct staff to develop new provisions in the Tākaka Freshwater Plan Change that require exclusion of stock from waterbodies and sensitive areas through:
    i. fencing, or
    ii. stock-proof natural barrier formed by topography, or
    iii. Council approved alternative stock exclusion plans

    including:
    1. provision for appropriate timeframes for this to be achieved by landowners
    2. consideration of slope, river size, and stock types

b) provide advice on suitable setbacks of fencing from waterbodies
c) continue financial support of landowners to achieve stock exclusion where projects meet the relevant funding criteria
d) consider ways the Council may attract or facilitate external funding assistance for stock exclusion.

We had hoped that by now the anticipated national regulations for stock exclusion would provide guidance on managing this, however we do not want to wait for this regulation to be progressed before requiring stock exclusion in the Tākaka FMU.

It is important that stock are excluded from waterbodies and sensitive areas to avoid faecal contamination of water, and bed and bank damage, including damage to riparian vegetation. Stock exclusion could be achieved by a number of means, including permanent or temporary fencing and natural barriers.

We are aware the dairy industry under the Clean Streams Accord have already completed stock exclusion on all accord streams (those >1m wide and 30cm deep) in the Tākaka FMU, and some landowners have gone beyond this, with exclusion on smaller waterbodies, and other features such as sinkholes.

[87] 11 of 12 members

Council provides subsidy for fencing materials for projects that meet the fencing fund criteria, and we support continuation of this in supporting proactive farmers.

One concern regarding stock exclusion is the high cost of fencing, particularly for relatively low-stocked beef and sheep farms on hill country, and also on flood prone land where fences are regularly destroyed. In these circumstances, we consider that alternatives should be able to be considered by landowners, in discussion with Council, on a case-by-case basis through the provision by applicants of an 'alternative stock exclusion plan'[88].

Table 9 shows a draft of potential requirements for your consideration, which includes stock exclusion for cattle, pigs and deer, with a catchall for other stock (eg sheep, goats, horses, lamas and alpacas). It utilises the Clean Streams Accord classification of rivers and incorporates consideration of river size and slope. Further discussion with stakeholders is needed around suitable timeframes for exclusion to be implemented, and application to different waterbodies, including classification of rivers[89] and sinkholes (refer Section **Error! Reference source not found.**).

Table 9 Draft Requirements for stock exclusion from waterbodies

Water body type or feature	Rivers >1m wide (wetted width) or >30cm deep		Rivers <1m wide (wetted width) or <30cm deep		Replanted riparian margins; constructed wetlands or filter areas	Open and Closed Sinkholes, Springs, Lakes, Wetlands, and Estuary margins
Slope	Slopes <15 degrees	Slopes >15 degrees	Slopes <15 degrees	Slopes >15 degrees	All slopes	All slopes
Dairy Cattle	[ND+12mths]	[ND+12mths]	[ND+2yrs]	[ND+2yrs]	All stock excluded prior to planting or by [notification date + 12months]	[ND+12mths]
Pigs	[ND+12mths]	[ND+12mths]	[ND+2yrs]	[ND+2yrs]		[ND+12mths]
Beef Cattle	[ND+2yrs]	[ND+4yrs]	[ND+6yrs]	[ND+6yrs]		[ND+12mths]
Deer	[ND+2yrs]	[ND+4yrs]	[ND+6yrs]	[ND+6yrs]		[ND+12mths]
All other stock[1]	[ND+4yrs]	[ND+4yrs]	[ND+6yrs]	[ND+6yrs]		[ND+12mths]

1. Other stock could include sheep, goats, horses, lamas and alpacas (but excluding free range chickens).
2. Stock exclusion is required to be complete before 1 July in the year stated. ND = notification date

[88] Other methods need to be investigated for research on effectiveness, but could include management of stock behaviour through provision of stock water, shading and shelter away from waterbodies, or emerging technology innovations such as virtual fencing eg NZ trials by AgResearch.

[89] For example, whether this applies only to perennial streams or intermittent and ephemeral rivers when water is flowing.

11.2.3 Waterbody setbacks

FLAG recommendation 24:

That the Council, for the Tākaka Freshwater Management Unit:

a) instruct staff to develop new provisions in the Tākaka Freshwater Plan Change that manage waterbody and sensitive area setbacks for:
   i. High risk activities and practices; and
   ii. New infrastructure

that can potentially generate contaminant discharges, to ensure there is sufficient distance for filtration or interception of contaminant discharges should they occur.

We consider that activities or infrastructure with high risk of discharges to water should be set back from waterbodies and sensitive areas (eg critical pathways) to ensure there is sufficient distance for filtration or interception of contaminant discharges should they occur.

Setbacks are needed from:

- Rivers and streams (beds)
- Lakes
- Wetlands
- Open and closed sinkholes
- Coastal marine area, including estuary margins
- Critical pathways (such as overland flow paths – refer appendix 16.7.5.2)
- Te Waikoropupū reserve (refer section 11.2.3.2).

We recommend the following high risk activities be set back from the features listed above:

- Soil disturbance
- Feed-pad or standoff-pads
- Strip-grazing or break-feeding
- Cultivation
- Earthworks
- The destruction or removal of woody or native vegetation, and
- Chemical storage or refueling

Exceptions should be included where soil disturbance or vegetation removal is needed for:

- plant pest control
- maintenance of an authorised utility service line (eg pipelines)
- implementing waterbody restoration plans, and
- pasture renewal.

In addition, we would like to see any new infrastructure located away from waterbodies and sensitive areas:

- Water trough for stock water
- Silage pit or storage
- Offal pit or storage
- Refuse pit or storage
- Compost piles or storage
- Stock effluent management system, and
- Domestic wastewater systems.

The inclusion of activity setbacks, in addition to discharge setbacks, is precautionary. If well managed, these activities may generate no discharge or runoff, but if faults occur, or management practices change over time, these activities have the potential to then discharge sediment, nutrients, chemicals, and microbial pathogens. Having these activities located further away from waterbodies and sensitive areas minimises the risk of such discharges reaching water.

Council staff have begun thinking on possible setback distances and can advise Council on this work.

11.2.3.1 Protection of karst sinkholes

FLAG recommendation 25:
That the Council, instruct staff to:

a) investigate classification of karst sinkholes based on the likely risk to groundwater quality from contaminated runoff, to provide a pragmatic basis for their management, and
b) incorporate appropriate management of sinkholes in the Tākaka Freshwater Plan Change, to avoid contaminated runoff entering sinkholes.

Karst sinkholes (or dolines) occur across the Tākaka FMU associated with both the marble and limestone geologies. The number, locations and types of sinkholes in each zone have not yet been confirmed, but initial investigations suggests there are a number clustered in areas of the Waingaro, Tākaka Remainder, Upper Tākaka, Motupipi, and Tākaka Township zones.

Karst sinkholes are both potential pathways for pollution and special environments to protect[90]. Discharges to karst sinkholes have the potential to affect water quality in associated groundwater, particularly those that drain rapidly to subterranean areas through open holes, fissures or caves. Karst systems are known for rapidly transmitting water with little reduction of any contamination within it[91].

Currently the discharge of soil, vegetation, effluent, refuse, offal or debris into any open sinkhole is a discretionary activity (requiring a resource consent) in the TRMP (refer rule 36.1.5.1). Further reference to sinkholes (and open sinkholes) is made in some rules requiring avoiding runoff from specific discharge types.

We would like to see more consistent reference to sinkholes in the TRMP rules (refer Section 11.5), to improve protection of sinkholes, including consistent use of activity and discharge setbacks.

We also want to avoid over-regulation of farm land containing sinkholes that may have lower risk to groundwater –for example wide shallow, sinkholes that filter through a significant amount of soil material before reaching groundwater. During FLAG discussions, council staff have suggested that sinkholes could be further classified in relation to their likely linkage to subterranean systems to seek a practical means to identify sinkholes for different management approaches - with the assumption that the faster they drain, the more direct their potential connection to groundwater. However further work is needed to confirm a suitable approach (hence our recommendation above).

[90] Open sinkholes and caves have special, often sensitive ecologies, and sinkholes that hold water (closed sinkholes) form lake environments, such as Lake Killarney. Damage to karst systems can happen both rapidly, with great impact, and slowly with little apparent impact.
[91] Refer Urlich, 2002 and Ford and Williams, 2007.

11.2.3.2 Setback of discharges and activities from Te Waikoropupū reserve

FLAG recommendation 26:

That the Council, for the Waikoropupū Surface Catchments Zone, instruct staff to develop new provisions in the Tākaka Freshwater Plan Change that:

a) require setbacks from Te Waikoropupū reserve for:
   i. High risk activities and practices; and
   ii. New infrastructure

   that can potentially generate contaminant discharges, to ensure there is sufficient distance for filtration or interception of contaminant discharges should they occur; and
b) includes consistent reference to Te Waikoropupū reserve setbacks within the discharge rules to manage risks from contaminated runoff.

Currently there are various setbacks of discharge types from waterbodies, bores and the coastal marine area in the TRMP discharge rules. We want to include specific reference to setback from Te Waikoropupū Springs reserve for both discharges and the activities that can generate discharges, if not well managed.

In particular, specific discharges that should include a setback in the current discharge rules include:

- bird or animal effluent (eg dairy and poultry sheds)
- human wastewater or greywater
- leachate from compost or offal pits

Activity setbacks are discussed in Section 0 above and the same management of activities and new infrastructure should be applied to Te Waikoropupū reserve.

Setbacks of 100m from the Waikoropupū reserve boundary have been discussed by FLAG. This distance does not have a science basis, but is intuitively considered appropriate by FLAG and MKM for protecting the mauri of the springs, and allows for sufficient space for attenuation or management of discharges before they reach the reserve boundary. We do not expect that this setback will affect existing activities, but it will avoid any future activity or discharge being located in close proximity to the springs.

Setback from the Waikoropupū reserve boundary is also a pragmatic approach, as landowners will be able to readily measure the required setbacks from the reserve boundary, rather than any water body within the reserve.

11.2.4 Specific practice standards

FLAG recommendation 27:

That the Council instruct staff to:

a) engage with industry and stakeholders to identify high risk practices with agreed industry good practice methods; and
b) develop new provisions in the Tākaka Freshwater Plan Change that require those practices to be undertaken using the agreed industry good practice method.

There are some practices well-known for causing contaminant discharges and there are already agreed industry good practice methods for how these can be undertaken to minimise risks. We consider these good practice methods should be followed by everyone, and that regulation requiring this would ensure everyone uses these methods.

To this end, we identify and recommend the following:

- Any strip-grazing or break-feeding is undertaken in a down-gradient direction starting at the highest elevation within the paddock;
- Any cultivation is carried out predominantly on the contour.
- Activities that generate bare soil are done with erosion and sediment controls in place

Discussion with industry and stakeholders is needed to confirm suitable practices for this list.

11.3 Risk to Water framework

To manage the effects of diffuse discharges on water quality and health, we have chosen to focus on land use in the FMU, and ensuring everyone is operating at a 'good practice' level. Our reasoning behind this approach is discussed in Appendix 16.7, and is largely underpinned by our agreed assumptions:

1. *Particular land uses (and practices) generate contaminants that can affect water quality and management should focus on these sources*

2. *Different catchment areas have different influences on the rivers, aquifers and Te Waikoropupū - and our management should reflect these connections.*

Further to this, FLAG want effort by industry and Council to focus on those land uses and practices that have the greatest risks to water quality, and for risk to water to be a clear priority in farm environment planning.

We acknowledge that some members of the community may consider meeting good practice as a low bar to set, however as discussed in Appendix 16.7, due to generally very good water quality, we are seeking primarily to manage risks to water quality, not to fix a widespread water quality problem. Ensuring everyone is at least at good practice is the first step to ensure the future risks are managed. This, in combination with the other parts of our recommendation package, and existing regulatory controls, provides an integrated approach to freshwater management in the FMU.

Whilst we have consensus amongst FLAG members on the importance of everyone achieving good practice, and the core elements of the framework, there is not an agreed clear path on *how* this should be implemented. Further consideration and discussion is needed on the appropriate mix of non-regulatory methods and regulation required to effectively and efficiently achieve the aims.

FLAG recommendation 28:

That the Council, for the Tākaka Freshwater Management Unit:

a) adopt in principle the aims of the Risk to Water framework and the aims for any implementation approach as outlined in Section 11.3.1 (1-6 and A-C); and
b) instruct staff to identify land uses considered to have moderate or high risk to water in the Tākaka Freshwater Management Unit, for confirmation by Council in discussion with iwi and stakeholders as needed; and
c) instruct staff to progress work to define the most appropriate implementation method for:
    i. ensuring that everyone undertaking land uses with moderate to high risk to water show that they are operating at good practice and managing on-farm risks to water,

including management of diffuse discharges, and meeting the minimum standards outlined in Section 11.2;

ii. ensuring monitoring, audit and compliance of good practice implementation; and

iii. ensuring responsive management in the Arthur Marble Aquifer Recharge Zone to increase regulatory controls, if any freshwater objectives are not met at Te Waikoropupū main spring.

Should you adopt in principle our recommended approach to managing risks to water (FLAG recommendation 28) we ask that you undertake further discussion with iwi, industry and other stakeholders to work on the best implementation approach. We believe you are best placed to lead this detail given your responsibility for implementation – we are happy to provide our feedback on any implementation approaches you consider.

11.3.1 Aim of the Risk to Water framework:

The aim of the Risk to Water Framework is to **ensure landowners, throughout the Tākaka FMU, are operating at good practice levels**, and to:

1. Embed managing of risks to water in day-to-day farming
2. Focus effort on land uses with moderate to high risk to water
3. Avoid duplication of effort and minimise compliance costs (for landowners and Council)
4. Provide certainty and clarity on expectations for land owners and community
5. Focus effort and costs on those not meeting good practice
6. Adapt controls if freshwater outcomes are not being achieved over time

Every farm is different, even within the same farm type, and the definition of good management practice will need to be farm-specific taking into account on-farm characteristics[92]. We do not intend that Council tell farmers how to farm, rather that Council makes clear the expectations for farm environment planning with regard to freshwater, and that farmers are able to show that they are managing the risks from their specific activities within their own farm context.

In addition, we recognise that farm environment planning is done for a number of reasons, including market drivers, farm profitability, health and safety, and animal welfare requirements. The aspect of farm planning we have focused on is solely for managing risks to water quality and water body health. The requirements for this may be different to those from the other drivers of farming environment planning, and this may result in a need to amend existing farm plans to ensure they meet the requirements for managing risks to water.

In deliberating the likely acceptability of the Risk to Water planning (good practice) approach to landowners, iwi, the community and Council, we identified the following key considerations:

- Whether it is enabling and individualised for farmers
- Implications for those who have, or have not undertaken (and recorded) farm environment planning previously
- Costs of requirements, particularly for small operators, including timeframes for action which can affect affordability
- How existing industry programs can be effectively used to minimise duplication of effort and how industry programs can be audited and removed from the process if not performing

[92] Including physical characteristics such as soil types, slopes, rainfall, presence of waterbodies, and management characteristics, such as stock and crop types, stocking densities, pasture and crop management approaches, etc

- Independence and transparency of auditing, particularly given the current lack of community trust in Council and industry to effectively manage risks to water
- Effective compliance and enforcement – how to focus effort on non-compliance and reward leading performers
- How long it might take to see actions and desired outcomes realised
- Whether this framework might work for other FMU in Tasman.

In summary, FLAG's recommended aims for any implementation approach for the Risk to Water framework are to:

A. **Provide clear expectations:**
   i. Provide a clear framework for farmers, industry and industry programmes that articulates community expectations and minimises uncertainty
   ii. Focus effort on activities with high and moderate risk to water(effects based) that are not currently addressed through other regulation (ie discharge rules), and enables Council to address diffuse discharges associated with land use
   iii. Acknowledges 'one size does not fit all' and avoids telling people how to farm, but outlines clear bottom lines for unacceptable practices
   iv. Avoids using Overseer in regulation (however its use in farm planning is encouraged) (refer Appendix 16.7.4)
   v. Provides the community with an appropriate level of transparency and confidence that water and land users are implementing good management practice

B. Be cost effective and straightforward to implement:
   i. The framework should not be cost prohibitive or overly onerous for landowners or Council
   ii. Be as permissive as possible – FLAG prefer not to 'consent farming' if possible, but also acknowledge that Council needs to enable effective compliance and cost recovery
   iii. Need to minimise compliance costs and avoid duplicating effort for everyone, and minimise compliance resourcing needs for Council by utilising industry programmes where these meet Council's requirements
   iv. Provide equity and fairness in how costs are distributed and recovered
   v. Enable Council to focus compliance efforts on higher risk activities and poorer performers
   vi. Take account of historic issues needing to be addressed by current landowners (eg loss of riparian vegetation) who may need assistance to achieve our desired goals
   vii. Enables individual farmers and industry to innovate and identify solutions to their risks to water and facilitate sharing of those innovations across landowners and between industries

C. Provide information to inform future management and be adaptable:
   i. Provide information on who is doing what, and where, to inform future review of both non-regulatory support and more targeted regulation if freshwater objectives are not being met
   ii. Allow for increasing control or regulation and enforcement where: freshwater objectives are not being met; trends are getting worse so a breach is expected; or non-regulatory methods are not working or working too slowly.

11.3.2 Key elements of Risk to Water planning

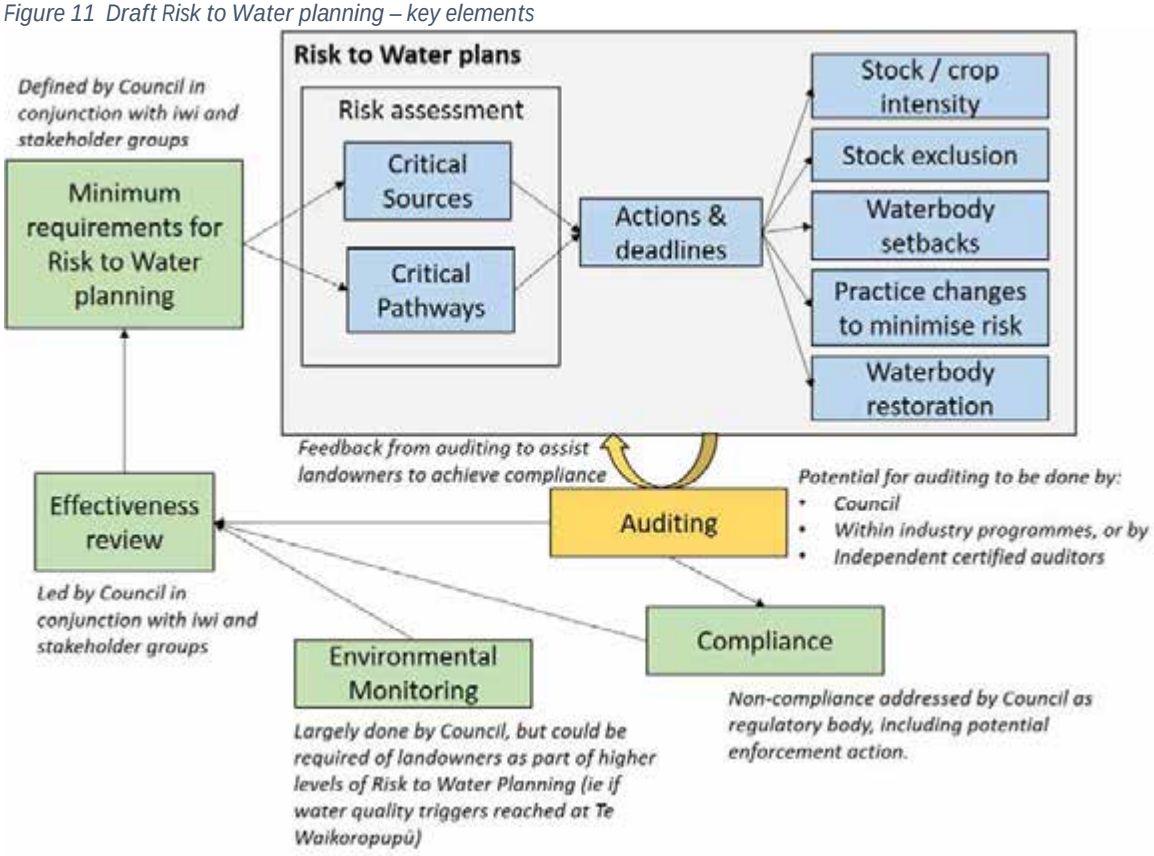
Work has been occurring around the country looking at what good management means. In addition to local knowledge, there are a number of useful resources available from different industry sector groups, government organisations and regional councils[93], which have been referred to in identifying the key elements of managing land use for good water quality outcomes.

While every farm is different and different land use types have different risk profiles, there are common fundamental elements to all risk to water planning (refer Figure 11):

1. **Critical Sources** - identification and mapping of **sources of risk** (practices, activities or areas that generate discharges)
2. **Critical Pathways** - identification and mapping of pathways by which contaminants can travel into water (both overland and through the ground)
3. **Action Plans** - identification of changes to farm management and practices that can manage the sources of contaminants, or the pathways, to reduce the risk, and includes setting of deadlines for changes to be implemented
4. **Auditing** of actions and changes to ensure timely implementation of Action Plans
5. **Effectiveness assessment -** comparison of the risk to water planning and actions with measurements of water quality and waterbody health, to assess effectiveness of changes.

The Risk to Water framework and the key elements are illustrated generally in Figure 11 and including incorporation of the minimum standards outlined in Section 11.2.

Figure 11 Draft Risk to Water planning – key elements



[93] For example: Industry-agreed Good Management Practices relating to water quality (18 September 2015) developed by Dairy NZ, Beef and Lamb NZ, Horticulture NZ, Deer Industry NZ, NZ Pork and the Foundation for Arable Research as part of the Matrix of Good Management project in Canterbury

Examples for possible content for the minimum requirements for Risk to Water Plans is provided in Appendix 16.7.5. We have not agreed on the specific details of this draft content – we include it to provide you with an understanding of the possible scope of content. As stated above, we think confirmation of this level of detail is something that needs to be done by Council in conjunction with iwi, industry and stakeholders following your adoption of the approach.

The proposed Risk to Water planning leaves the selection of the most appropriate method to address the identified risks up to farmers as part of their planning assessments. This will require education and advocacy support from Council and industry groups to support landowners in trialling and sharing practical and effective methods within and between different industries.

We acknowledge that this approach is dependent on suitable commitment from land users and industry group support. Without this, water quality outcomes will not be achieved, and future review of freshwater management may be forced to take an increasing regulatory approach to ensure commitment and compliance.

11.3.3 Auditing

Auditing is important to the success of this framework, including its acceptability to the local community as a management approach. Auditing could be undertaken by Council, existing industry programs, or independent auditors. The message we heard from public feedback is that there is distrust in both Council's and industry bodies' ability and capacity, to audit required practice, and to undertake enforcement to ensure compliance by everyone. Whilst we see auditing as the way to ensure the approach isn't dismissed as "green-wash", and as part of ensuring outcomes are achieved, we don't want that the auditing process to create unnecessary or excessive bureaucracy or cost for landowners and ratepayers. These matters need further consideration by Council, in conjunction with industry bodies.

11.3.4 Who should manage their risk to water?

Everyone needs to manage the activities they undertake that could have risks to water, as even small-scale activities, if poorly managed, can have significant impacts on waterbodies and affect our values of water. However, some activities have greater risks than others, and we have focused on land uses that have a moderate to high risk to water for any one or more of the following contaminants:

- Sediment
- Nitrate
- Phosphorus
- Microbial pathogens

Council staff have undertaken an initial assessment process of identifying activities with a risk to water considering:

- The potential for generation of sediment, nitrates, phosphorus or microbial pathogens, for example dairy is known for the high potential to generate sediment and *E.coli* discharges
- The affinity of stock types to water – ie cattle and deer will seek out and stand in water, while sheep tend to avoid it (though stock are also known to 'camp' under vegetation providing shade, which is often near waterbodies)
- General industry track record for issues or complaints arising from industry compliance for discharges to water

- Resources available on different industry risks[94]

This initial assessment did not include consideration of potential good practice undertaken to minimise risk, or site specific mitigating factors, such as soil type and climate. This is because the activities list is an initial 'gateway' for requirement of Risk to Water plans, and any site or farm specific mitigations would be captured within these plans as a means of addressing or reducing risk.

Risk to Water planning is considered a "minimum good practice", that all land users should be able to readily undertake. For several industries, land users will likely already have undertaken this as part of industry programs or previous farm environment planning. For this reason, the classification of land uses to the high and moderate categories has erred on the side of caution and has been more inclusive, than exclusive.

We recognise that some aspects, such as pasture renewal or forestry harvest are higher risk activities, however they only occur during a relatively small part of the land use lifecycle and there are other rules within the TRMP and national instruments, that can be used to manage these (eg land disturbance rules and National Environmental Standard for Plantation Forestry – NES-PF). It is expected that in undertaking a risk to water assessment these higher risk practices will be identified and existing compliance with other rules or instruments (eg provision of management plans required under the NES-PF) can be identified as a means to address the risk.

Table 10 identifies the potential categories of high and moderate risk to water activities for use in the Tākaka FMU. This list requires confirmation by Council, in discussion with industry and stakeholders.

Table 10 Draft classification of High and Moderate Risk to Water Land Uses

High **Risk to Water Land Uses**	**Moderate** **Risk to Water Land Uses**
• Dairy Farming • Dairy Support Farming • Outdoor Vegetable Growing • Fodder Crops (cultivated or grazed) • Poultry Farming • Deer Farming • Pig Farming	• Beef Farming • Cropping • Fodder Crops (permanent or harvested) • Plantation Forestry • Indoor Vegetable Growing (without nutrient cycling) • Sheep Farming[95]

The proposed framework suggests the same Risk to Water planning requirement for both high and moderate risk activities - the distinction between high and moderate risk will be reflected in the scale and detail of the Risk to Water planning. This distinction also allows for different management of these categories if Tākaka FMU freshwater objectives are not met.

Activities that are Low Risk to Water land uses (ie those not listed above) could also undertake Risk to Water planning to ensure their particular activities are having minimal effect on water, but it is not considered necessary that this be managed by Council.

[94] Refer AgResearch 2010 and ESR (draft - date unknown)
[95] Refer ESR (draft - date unknown) on microbial pathogen risks from sheep and lambs

Examples of land uses considered as Low Risk to Water include:

- Nurseries
- Fruit and Nut growing
- Indoor Vegetable Growing ('fully closed' with nutrient cycling)

11.3.5 Use of existing industry programs

As part of Risk to Water framework, FLAG recommend that Council pursue how the requirements can be met through existing industry programs that require farm environment planning[96].

The intention of utilising existing programs is to:

- Avoid duplication of effort, for farmers and Council:
  - Farmers only undertake Risk to Water planning within their industry program, without needing to separately provide plans to Council
  - Council utilises the capacity of existing programs to provide auditing and compliance monitoring and reporting
- Close the gap in industry programs' ability to obtain compliance from members by formally requiring compliance reporting to Council as part of the program approval criteria
- Utilise existing farmer–industry advisor relationships. This can also be supported by Council land advisory personnel thereby building shared understanding and supportive relationships across all involved parties.

We acknowledge that the success of using existing industry programs relies on the programs being 'Council approved' against pre-set criteria[97]. We suggest that the approval criteria seek to ensure that industry programmes:

- meet the Risk to Water requirements
- provide the necessary ongoing support to landowners to achieve long-term compliance and improvements reflecting industry good practice
- provide the necessary compliance monitoring and auditing, including reporting to Council, to provide transparency to the community and ensure the effectiveness of the framework.

Whilst the FLAG is loath to see more bureaucracy, we recognise that it is necessary for Council to audit the industry programs and remove Council approval if the programs do not continue to meet the risk to water requirements.

11.3.6 Responsive management of Arthur Marble Aquifer recharge zone and Te Waikoropupū

Adequate and precautionary protection of Te Waikoropupū and its outstanding values is of upmost importance to iwi and many in the community (locally, nationally and internationally).

We consider the existing water quality at the springs to be in a 'maintain' state (meeting the freshwater objectives and providing for the values of water – refer Section 7.2).

There is concern from some members of the FLAG, iwi and the wider community that although water quality is currently very good (and clarity exceptional), there is still a risk of water quality degradation at Te Waikoropupū. This risk arises from the incomplete understanding of the Arthur Marble Aquifer system, the lag in observing effects on water quality at the springs, and the uncertainty of the effectiveness of proposed management approaches to water quality in the

[96] For example the Fonterra Tiaki program, Beef and Lamb Farm Environment Planning, NZ GAP and Global GAP.
[97] Staff have worked on draft criteria and will make these available to you for any ongoing discussions.

recharge area, particularly if land use intensifies. Of those factors, the only ones we can directly control or influence are improving our understanding of the aquifer, and making the management approaches precautionary and adaptive to change.[98]

Technological advances and affordability may help us to better understand the aquifer in the future, in the meantime we can focus our efforts on minimising contaminant risk from land use.

While risk to water quality is managed by overlapping levels of conservativeness built into the proposed management (including the water allocation regime options and the potential adaptive management approach with the 'stepped' approach (option 2) in the AMA; land intensification controls; and the Risk to Water framework), we are also proposing that a responsive (adaptive) management[99] framework be defined for the Arthur Marble Aquifer recharge area.

Based on the current range of land uses and intensity occurring in the recharge area, we anticipate that with everyone operating at good practice any further human created impacts on water quality will be avoided or minimised into the future. However, if monitoring at the main spring indicates (trends of) declining water quality our intention is that the requirements under the Risk to Water framework will be reviewed and increased (refer FLAG recommendation 28 c iii).

This approach is consistent with the NPS-FM (policy A2) to specify targets and implement methods if freshwater objectives are not being met. We see identification of pre-emptive triggers for further action, and defining the required increases in action, as a proactive approach. It signals to landowners what further requirements or controls may be required if water quality trends are undesirable, to help inform their farm planning decisions.

This approach acknowledges we are making decisions with imperfect information, and provides an avenue to change management, if our recommended approach turns out to be inadequate.

Triggers for action need to be set to avoid any adverse impact on the values of the springs. We have not confirmed the trigger levels for use in a responsive regime, because we anticipate that the recommendations of the Special Tribunal (WCO) will provide further direction for Council on this, however, draft triggers are provided in Appendix 16.7.5 for your consideration.

In terms of the further actions required if the triggers are breached, this could include:

- More detailed information provision to Council as part of the Risk to Water planning requirements to improve understanding of catchment sources and pathways of risk
- Higher levels of good practice to be actioned
- Monitoring of water quality by landowners to establish farm-specific effects
- Increased compliance and auditing requirements
- Changes to activity status (ie requiring resource consent) for certain land uses or practices

Further work is needed to define the implementation options, triggers and potential actions and this is captured in FLAG recommendation 28.

[98] We note that there are risks from tourism and visitor impacts at the springs, but these are managed by DoC, and we have not sought to address these in our recommendations to you.

[99] We are aware that the term "adaptive management" has become one where meaning and application are debated. To avoid the approach we are proposing being mired in arguments around semantics, we are calling our recommended management approach "responsive management" – in essence one where the type and level of management approach will respond to the management outcomes.

11.4 Management of riparian vegetation and aquatic habitat

FLAG recommendation 29:

That the Council:

a) resolve to develop, and implement, a non-regulatory program to support and encourage riparian and aquatic habitat restoration in the Tākaka Freshwater Management Unit (FMU), including consideration of ways that Council may facilitate riparian and aquatic habitat restoration at a FMU scale; and
b) instruct staff to develop new provisions in the Tākaka Freshwater Plan Change that:
    i. further protect riparian vegetation from removal or degradation, including protection of restoration plantings; and
    ii. require waterbody restoration plans to be implemented by 2050 to support the non-regulatory program for riparian and aquatic habitat restoration.

FLAG recommend riparian restoration and protection in the Tākaka FMU as a key approach to achieving healthy freshwater ecosystems. This section outlines why we have chosen to focus on riparian restoration and why we think this is an essential part of freshwater management in the Tākaka FMU alongside the proposed management regime for freshwater quantity and quality.

During consideration of water quality management it became clear that riparian vegetation also plays a key role in water quality. Shading of river waters, particularly smaller, shallower waterbodies[100] (ie rivers less than 10m wide) can have significant benefits for water temperature and light levels, which in turn influences other water quality attributes, such as dissolved oxygen levels and nuisance plant growth (which also further exacerbate dissolved oxygen levels, as seen in the Te Kakau Stream). This can be particularly important in times of low flow, improving ecological resilience to the effects of drought.

Vegetation of river banks, including deep and densely rooting species (eg *Carex geminata* which spreads through stolons/runners), can help protect against erosion and subsequent sedimentation of waterbodies and downstream receiving environments.

Providing for the Ecosystem Health value, and other values that are dependent on healthy ecosystems[101] requires consideration of more than just water flows and water quality. Native plant and animal species need diverse and functioning habitats in which to live.

The NPS-FM states that "in a healthy freshwater ecosystem ecological processes are maintained, there is a range and diversity of indigenous flora and fauna, and there is resilience to change." It highlights essential habitat needs of flora and fauna and the connections between water bodies as key matters to consider.

Riparian and aquatic restoration can improve provision of food to both aquatic and terrestrial animals, improve biodiversity, increase appeal for recreation and natural character values, and provide for improved mahinga kai and fishing values.

[100] Particularly for smaller low-land streams and those close to the coast as these waterbodies can also have high biological diversity and be more adversely affected by loss of shading and riparian habitat.
[101] Such as Fishing, Food and Resource Gathering, including mahinga kai, Natural Form and Character, and Livelihood and Economic values related to tourism.

11.4.1 Riparian vegetation and waterbody restoration

Riparian restoration of smaller lowland streams is identified by Council's freshwater expert Trevor James, as the single greatest thing (but seldom the only factor) that can be done to improve the ecological health of Tasman's waterways.

Waterbody restoration includes consideration of not only riparian habitats, but also aquatic habitats, particularly where waterways have been straightened and instream habitat diversity has been lost.

Our recommended management approach for riparian habitat loss is to promote and support enhancement and restoration of riparian vegetation cover. Many such projects are already occurring across the district and in the Tākaka FMU[102].

We recommend that riparian and aquatic restoration be implemented through non-regulatory methods, with Council providing support of landowners and community-landowner networks.

However, to ensure that riparian restoration takes place, a 'regulatory backstop' is needed – ie a rule that requires a restoration plan to be in place and planting commenced by a certain time. A timeframe of 30 years was suggested by staff for this backstop, using the example of the approximate timeframe and good achievements made by Taranaki Regional Council in utilising a primarily non-regulatory approach to encouraging riparian restoration.

FLAG's aspirational restoration goal for the Tākaka FMU is restoration of:

- Wetlands and springs (and their connection to other waterbodies)
- Perennial lowland streams (refer Figure 12), between 1 and 10 metres wide (as these are the streams that benefit most from riparian cover)
- Waterbodies close to the coast (including estuary margins) - which can have very high ecological values and high biodiversity, and include features such as inanga spawning sites.

We acknowledge this goal is large and not readily achieved by landowner, community groups or Council alone. Further work is required to understand the scope and extent of this goal, how long this might take to achieve, and options for how this can be affordably achieved by the community within acceptable time frames.

We recommend that you consider what role Council could play in facilitating restoration, including:

- Facilitating the development of an FMU wide restoration vision and plan
- Resourcing the identification of external funding (ie from New Zealand and overseas funds) to help pay for local restoration projects[103] and assisting applicants in applying for these funds
- Using the buying power of the Council in facilitating cost savings to multiple smaller restoration projects (eg as done by Taranaki Regional Council in bulk purchase of plants on behalf of participating landowners)
- Facilitating the partnering of iwi, landowners and community groups in implementing targeted restoration programs and providing ongoing support to ensure their long-term success.

[102] Refer Council's video Our Waters in Common and the range of projects supported by local groups, such as the Golden Bay Streamcare Group and Tasman Environmental Trust. The Sustainable Dairying Accord also seeks for 100% of farms with Accord waterways to have riparian management plans by May 2020.
[103] Including plant and animal pest management

FLAG also support the recommendations by MKM identified in the Manawhenua Mātauranga report (MKM 2018)[104] including both those actions to be undertaken by MKM, and those by Council - namely, that the Council:

- Support and assist in the co-ordination of catchment-wide restoration initiatives
- Adopt stronger polices and rules to avoid the removal of existing vegetation for riparian areas (refer Section 11.4.2 below)
- Adopt policies, rules and non-regulatory methods to support planting and pest control initiatives on private land
- Assist in the development of a catchment-wide pest control plan to complement community-driven restoration and enhancement initiatives.

11.4.2 Riparian margin vegetation protection

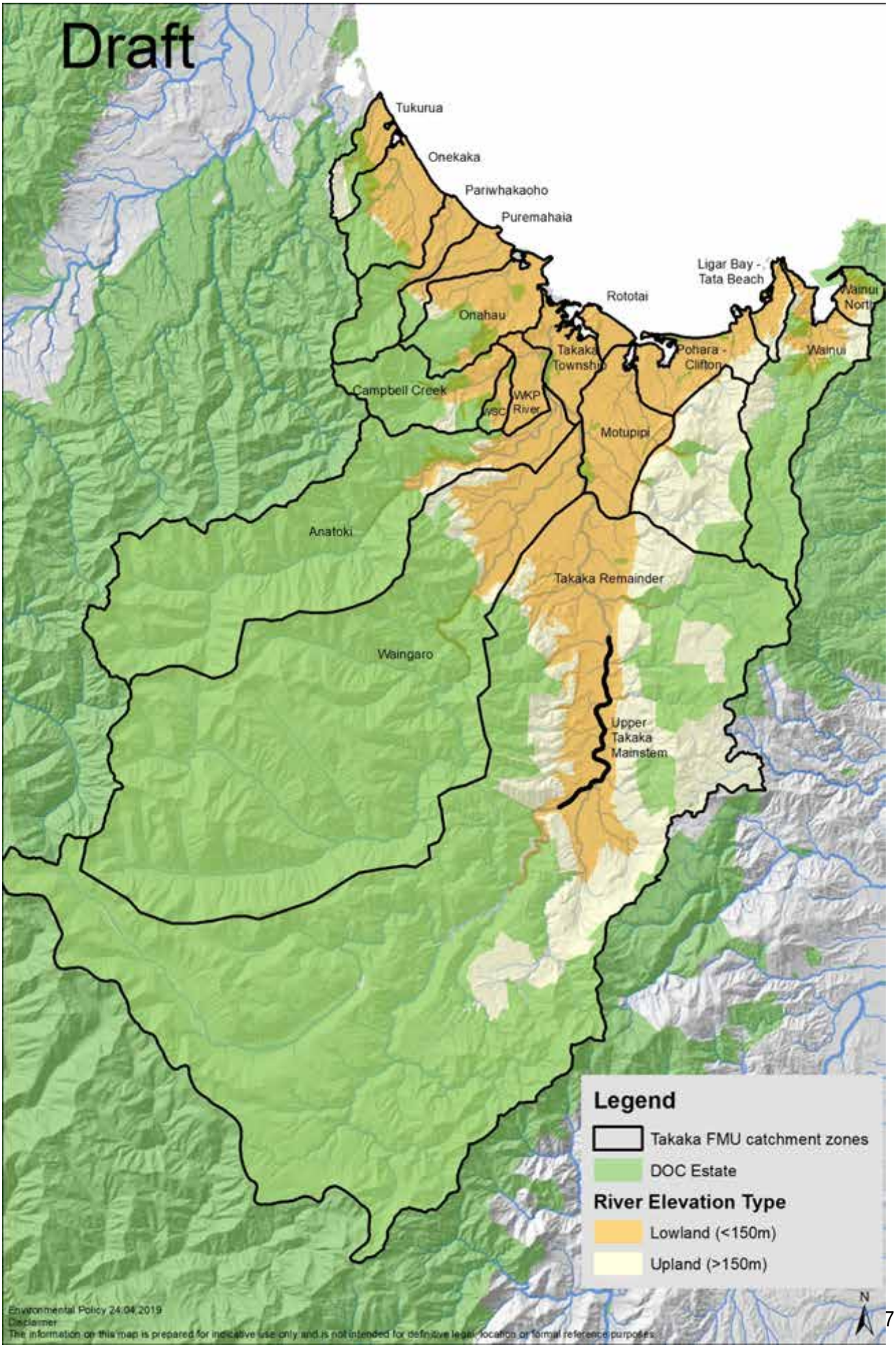
The TRMP already recognises the importance of riparian vegetation and habitats in providing for water quality, habitat and biodiversity outcomes[105]. However, Council staff have advised that there are limited associated rules[106] to avoid the destruction or removal of vegetation, and the protection is afforded only to indigenous vegetation and forest. 'Indigenous vegetation' and 'indigenous forest' have narrow definitions in the TRMP that limit the effect of the protections to naturally occurring vegetation with at least 50% or 70% indigenous species (respectively)[107].

Protection specifically for riparian vegetation is provided in the land disturbance rules[108], which require consent for any destruction or removal of 'indigenous vegetation' within 15 metres of the bed of any river or stream greater than 3 metres average bed width, and 15 metres of any lake. However, the limitation of this to 'indigenous vegetation' (at least 50% indigenous species and naturally occurring) means this does not protect regenerating vegetation (with less than 50% indigenous cover) or areas planted as part of restoration projects.

The effectiveness of these rules needs to be reconsidered to ensure that riparian vegetation can provide vital shading and habitat values for water bodies and aquatic habitat, and the effort involved in restoration of riparian habitat is protected for the future.

[104] Refer page 42 of the Manawhenua Mātauranga Report (MKM 2018)
[105] Refer policies in TRMP Chapters 8 (waterbody margins), 27 (river and lake beds) and 33 (discharges to land and freshwater)
[106] Refer TRMP rules for Rural 1-3 and Rural Residential zones
[107] Refer TRMP Chapter 2 Meaning of Words for full definitions.
[108] Refer TRMP Chapter 18.5

Figure 12 Lowland waterbodies in Tākaka FMU



11.5 Point discharge review

As discussed in Section 11.1 we have sought to manage diffuse discharges through managing the land use and practices that generate the contaminants of concern, rather than through further discharge rules.

The FLAG has not specifically reviewed the current discharge rules, and as discussed in section 12.4 any significant changes to these need to be done within a region-wide review. Staff have advised that programmed work on the 10 year review of the discharges part of the TRMP (2021) and the land disturbance rule review (2019) will influence and update the discharges rules at a regional level.

With regard to the Tākaka Freshwater Plan Change there are two recommended changes to the management of point source discharges:

- improved consistency of protection for karst sinkholes, and
- protection of Te Waikoropupū Springs.

There are numerous references to setbacks and avoidance of runoff throughout the discharge rules and these should also reference open and closed sinkholes (refer Section 0) and Te Waikoropupū (refer Section 11.2.3.2).

Refer to FLAG recommendations 25 and 26 regarding recommended changes to the discharge rules for the Tākaka Freshwater Management Unit.

12 Future Plan Review Topics

FLAG Recommendation 30:

That the Council resolve to:

a) include the following topics:

1. Further enabling and promotion of the use of non-consumptive takes,
2. Further enabling and promotion of the use of off-stream storage,
3. Review of the need for water take thresholds for permitted takes to protect small rivers,

as outlined in Section 12, in either:

i. The Tasman-wide freshwater plan change, as identified in the Council's 2018 Progressive Implementation Plan, or

ii. the Tākaka Freshwater Plan Change.

A number of issues identified during the FLAG process are issues we believe are better addressed in a region-wide plan review. These issues are:

- further enabling and promotion of the use of non-consumptive takes
- further enabling and promotion of the use of off-stream storage, and
- review of the need for water take thresholds for permitted takes to protect small rivers
- review of the discharge rules to further address risk to water quality

Each of these issues is described in more detail in the sections below.

Reasons for recommending that these issues are included in a region-wide review of water management include:

- All of the issues are potentially applicable region-wide and do not arise from issues unique to the Tākaka FMU, so to address them at once, rather than FMU by FMU would be more efficient[109]
- Staff advice is that the methods to address the issues may require changes to the plan structure, for example modifying the rule cascades
- Whilst the issues are important for managing water quantity and quality, we could not address every issue that came up if we were to finish the FLAG process and produce an output that addressed the priority needs to improve water management in the Tākaka FMU
- We are keen to see these topics addressed in a plan change, but have not looked specifically at how this is best implemented.

If Council do not wish to address these as region-wide issues, then FLAG request they be included in the Tākaka Freshwater Plan Change to ensure they are addressed for the Tākaka FMU. We have identified other topics for further consideration by Council that can also be included in a future region-wide freshwater review, but that do not need to be addressed imminently in the Tākaka FMU – these issues are identified in Section 15.

12.1 Encouragement of non-consumptive takes

The use of water for non-consumptive use, in particular hydro-electric power generation is already allowed for within the TRMP rule cascade. However, the rule cascade could be clearer with respect to non-consumptive use, which would also help achieve the aim of the National Policy Statement on Renewable Electricity Generation (2011) in supporting new and existing generation. Non-consumptive takes are not included in the accounting for allocation limits.

The FLAG recommends the key aims of the plan change are to:

1. Clarify the rule cascade and requirements for non-consumptive takes
2. Promote the use of non-consumptive takes, particularly for new micro and small scale hydro-electric use as one of the FMU values of water
3. Ensure non-consumptive takes do not have significant adverse effects on ecosystem health or other existing users, including the length of waterbody with reduced flow, effects at the intake and outflow locations, and any potential for pollutants to be picked up during water use.

12.2 Encouraging use of off-stream storage

We are supportive of the use of water storage by individuals to improve their security of supply and drought resilience, and to reduce impacts on water bodies.

The damming, take and use of stored water is already provided for within the TRMP rule cascade, however the rule cascade could be made clearer and potentially more enabling with respect to the damming, take and use of water involving storage, particularly to encourage use of off-stream storage. Off-stream storage is storage that is based on land and is not located in the bed of a river, for example dams in ephemeral gullies that harvest rainfall runoff. Off-stream storage can be filled

[109] Whilst, such a consideration may also hold true for aspects of the water quality management measures identified by FLAG, as the first FLAG to complete FMU based management to meet the requirements of the NPS-FM, we needed to recommend a comprehensive water quality management approach in the Tākaka FMU.

by takes from waterbodies, but does not have the added potential for effects on the functioning of rivers, unlike storage located within waterbodies (on-stream storage).

Further enabling of water storage is important in off-setting the potential effects on security of supply from the implementation of cease takes in all zones.

The FLAG recommends that the key aims of the plan change are to:

1. Clarify the rule cascade and requirements for takes to and from on-stream and off-stream storage
2. Promote the use of takes from off-stream storage by minimising consenting and compliance costs, to encourage its use to improve security of supply and resilience to drought

12.3 Water take thresholds for permitted takes on small rivers

We are concerned that permitted takes, particularly unrestricted stock water takes, might be adversely affecting small streams and creeks[110]. In particular, whether the cumulative amounts taken are exceeding ecologically sustainable levels at times of low flow, particularly given these water takes are not subject to cease take (refer Section 10.7).

The Onekaka Biodiversity Group, and subsequently staff (when looking into permitted takes on Fish Creek) brought this issue to FLAG's attention. Dr Young also discussed with FLAG that permitted takes could be an issue on some smaller streams and creeks.

Currently takes less than $5m^3$ per day, per site (including domestic and other uses) and stock water takes (unlimited for volume) are permitted activities in the TRMP. While the RMA (sec 14 3b) provides for both domestic and stock water takes, this is with the test that there is no adverse effects on the environment.

Given the potential that adverse effects may be occurring from cumulative permitted takes, this issue needs to be investigated and addressed. This includes designing or choosing a suitable methodology for estimating or measuring permitted uses and their potential effects. It is also likely to be an issue in other parts of the district, which would benefit from a consistent approach by Council.

The FLAG recommend that the key aims of the investigation and any subsequent plan change are to:

a) Determine if there is a potential issue with cumulative effects of permitted takes on small rivers
b) If a risk is identified, to identify suitable methods to minimise this risk (eg setting daily limits for permitted takes from small rivers)
c) Consider the means of accounting for permitted takes in zones, and ensuring compliance with requirements to protect the ecosystem health of small rivers.

12.4 Regional review of discharge rules

We raised questions with staff around how adverse effects from potential contaminants such as sediment, nitrates from effluent and fertiliser, and pesticide and herbicides are managed. In

[110] Council staff have suggested a threshold of small rivers as those streams and creeks with a mean annual low flow (MALF) of 100 l/s or less.

considering these questions and for consideration in the initial drafting of a Tākaka Freshwater Plan Change, staff have advised that while some of these aspects are managed through existing resource consents, there are a number of issues with the current discharge rules and that this part of the TRMP is due for a mandatory review in 2021[111]. We have not included this aspect specifically in our recommendations, as we expect this review to progress as required, and that it will include consideration of the requirements of the NPS-FM.

13 Non-regulatory Methods and Implementation Plan

13.1 Tākaka Freshwater Implementation Plan

Implementing the proposed new freshwater management regime, particularly the Risk to Water framework will require financial resourcing and may need additional staff and information management systems.

We ask that Council and staff thoroughly plan for this to ensure adequate resourcing through the Long Term Plan process to meet the requirements of the NPS-FM.

In particular, we recommend thorough consideration be given to additional staff resourcing for:

a) Compliance – increasing capacity for monitoring, investigation and enforcement
b) Land advisory - focused on education and advice on achieving good practice for water quality outcomes
c) Partnerships - building iwi, industry and community partnerships and securing external funding for restoration work and special education programmes, etc

We recommend the development of a Tākaka Freshwater Implementation Plan (Implementation Plan) to cover the non-regulatory methods in the proposed freshwater management framework. The non-regulatory methods are key to supporting management of freshwater to achieve the freshwater objectives and provide for the values of water identified by the FLAG. These non-regulatory approaches complement the existing and proposed regulatory provisions in the TRMP.

The recommended scope of the Implementation Plan is listed in the recommendation below and outlined in the following sections.

FLAG Recommendation 31:
That the Council instruct staff to develop a Tākaka Freshwater Implementation Plan for non-regulatory methods in the Tākaka Freshwater Management Unit (FMU) that includes:

a) **Development of recording and accounting systems, including:**
   i. systems required under the NPS-FM for monitoring of freshwater objectives and primary contact suitability
   ii. systems to record and manage Risk to Water plans and auditing

b) **Investigation and Monitoring:**
   i. continued investigation of ways to improve water quality at identified locations where desired water quality standards are not being met

[111] Sediment will also be addressed through the land disturbance rule review (underway).

ii. revision of Council monitoring programs to include relevant new freshwater attributes and sites to enable assessment against the freshwater objectives and provision for the values of water including:
    1. Continued SOE monitoring of water flow and quality at Te Waikoropupū main spring, with additional monitoring of water clarity and dissolved oxygen
    2. Continued monitoring of flow and water quality at Lindsay's Bridge as a reference site for surface water quality influencing the Arthur Marble Aquifer
iii. audit of onsite wastewater systems to understand the risk posed to water and to inform compliance and education and advocacy efforts
iv. investigation of riparian and aquatic habitat state in the FMU, and waterbody restoration needs, to better understand the scale of restoration required for improved water quality, ecosystem processes and biodiversity to provide for Ecosystem Health[112]
v. investigation of the potential effects of permitted takes on small rivers
vi. progressing work with manawhenua iwi to define cultural tohu (indicators) for use in setting freshwater objectives and State of the Environment monitoring to provide for cultural and spiritual values

c) Education, Advocacy and Behavioural Change:

i. Provision of additional resourcing (including staff) for education and advisory capacity within Council to work with iwi, local land owners, community and industry groups in the Tākaka FMU to promote, facilitate and encourage:
    1. Use and sharing of industry good management practice within and between industries for:
        - management of point and diffuse discharges to land and water
        - water use efficiency
    2. Waterbody restoration, including riparian vegetation and aquatic habitats
    3. Appropriate design, operation and ongoing maintenance of on-site wastewater systems

d) Works and Services:

i. Progress of work for:
    1. the Tākaka Urban Stormwater Catchment Management Plan in discussion with iwi and the community, including consideration for methods to improve the water flows, quality and ecological health of the Te Kakau and Motupipi Rivers
    2. investigation and implementation of approaches to improve water health in Lake Killarney
ii. Review Council's approaches to river channel management methods (including stabilisation, gravel management, flood control and herbicide/pesticide use) to ensure they achieve positive outcomes for Ecosystem Health and other values of water, in addition to erosion, flooding, gravel and pest management outcomes

[112] As per the Ecosystem Health value and management objective defined by FLAG and required as a compulsory value under the NPS-FM.

e) **Financial Measures:**
   i. Continue to provide financial subsidy (fencing fund) to support landowners to fence waterbodies for stock exclusion
   ii. Continue to provide financial subsidy (catchment fund) to support and facilitate landowners and the community to undertake waterbody restoration
   iii. Consider ways that the Council could help support landowners and the community to attract and efficiently use external funding to further waterbody restoration and stock exclusion efforts in the Tākaka FMU

f) **Further Regulation Review:**
   i. Regional review of water takes and discharges (as specified in Section 12)
   ii. Reviewing the resourcing and efficacy of compliance and enforcement efforts for management of water flows and quality

13.2 Development of accounting and recording systems

Council systems for accounting and recording of information under the NPS-FM for monitoring of freshwater objectives are needed to enable effective management of freshwater in the Tākaka FMU.

An accounting and recording system will also be required in implementing the Risk to Water framework (eg for storing Risk to Water plans), regardless of whether it is implemented through regulatory or non-regulatory methods.

FLAG have not considered this aspect in-depth because it is a detailed implementation matter regarding Council systems and related legislative requirements, however we highlight it as a necessity to be developed and resourced by Council.

13.3 Monitoring and investigations

Council staff have provided FLAG with summaries of the existing monitoring in the Tākaka FMU that occurs as part of the State of the Environment (SOE) monitoring programme (refer Appendix 16.8), sites that staff 'keep an eye on' through less regular monitoring[113], and special projects that have been undertaken to investigate specific issues and better understand causes and risks of water contamination.

During the FLAG process we raised questions about water flows and water quality at key locations regarding the key attributes identified to support the values of water (refer Section 8.2).

We acknowledge that data is not available for all sites in the FMU, or for all attributes for which data would be useful, and we recognise that data collection is limited by the monitoring budgets allocated to the Tākaka FMU, which has a flow-on effect to Council rate charges district wide.

We recognise that new monitoring to meet the requirements of the NPS-FM is likely to require additional funding, and possible changes to the current SOE monitoring programmes. We understand Council staff undertake periodic review of the Council monitoring programs, including SOE and planned investigations. We recommend that future reviews of the monitoring programme for the Tākaka FMU ensure:

[113] For example Payne's Ford above the Waingaro confluence and Anatoki at One Spec Road.

a) Data is collected to determine the current state of the key attributes (section 8.2) for which numerical freshwater objectives are identified
b) Water quality at sites with known water quality issues (section 16.7.1) continue to be monitored to identify trends to see if management is making a difference or not
c) New investigations are undertaken to better understand the risks to water in the FMU (refer Figure 20, section 16.7.1 and 16.7.2)

13.3.1 New monitoring and special investigations in the Tākaka FMU

We have discussed with staff, both new sites and new attributes that may need further monitoring in the Tākaka FMU, and some special investigations to improve our understanding of the state of key waterbodies or the risks to water health. Some of this work has already been progressed by Council staff using existing budgets or subsidies from external research funding, including:

- Baseline monitoring in Te Waikoropupū main spring (refer NIWA 2018) for:
  - Water clarity
  - Dissolved oxygen
  - Temperature

- New River SOE site at Lindsay's Bridge – added to the rivers SOE program in July 2016 to provide water quality information on the Tākaka River recharging the Arthur Marble Aquifer.

We recommend this monitoring continue.

We appreciate that you will need to undertake further work to understand the scope and costs of the new monitoring proposed, we trust that staff can advise how this links with existing FMU monitoring, and which addition of sites and attributes are a priority following completion of the freshwater objectives work.

Work has also commenced during the FLAG process to investigate and address water quality issues in Lake Killarney. Council staff can advise on the progress of this work.

13.3.1.1 Onsite wastewater audit

FLAG recommend that an onsite wastewater education and auditing project is undertaken in the Tākaka FMU. The reason for this is that failing onsite wastewater systems (eg old, poorly designed, or poorly maintained septic tanks) could be a source of both nutrients and microbial pathogens in the Tākaka FMU. Because most on-site wastewater systems are permitted activities[114], Council holds only limited information on these and does not have capacity to undertake regular permitted activity monitoring, and consequently staff were unable to inform us on the status of systems.

Staff estimate there to be approximately 950 on-site wastewater systems within the Tākaka FMU[115] - with approximately 520 of these potentially located in an area overlying an unconfined aquifer.

[114] Refer TRMP rules 36.1.2.4 to 36.1.2.7 – permitted activities must still comply with the conditions listed in these rules, including run-off of effluent to surface water and operation and maintenance requirements.
[115] Based on counts of residential and business sites located outside of council wastewater urban drainage areas (and less consented sewage discharges).

Based on our own knowledge[116], we believe that the potential risk to water from inadequately managed wastewater systems and the likely occurrence of this warrants an audit.

We understand from staff that an audit would be relatively inexpensive (between $40,000- $80,000 depending on the area covered[117]).

The results from such an audit, could be used to inform compliance efforts, as well as the implementation of education and advocacy advice, particularly if maintenance of systems is identified as a potential ongoing issue.

13.3.1.2 Riparian and aquatic habitat restoration assessment

Riparian and aquatic habitat is a key attribute for a number of values including Ecosystem Health, Fishing, Food and Resource Gathering, Cultural and Spiritual and Natural Form and Character.

Council has limited data on the state of both riparian vegetation and aquatic habitat in the Tākaka FMU - further information is needed to be able to set freshwater objectives and management goals for this attribute, and to understand the extent of restoration needed to provide for Ecosystem Health and other values dependent on this.

13.3.1.3 Permitted water take review

A review of the cumulative effects of permitted takes on small rivers is discussed in Section 12.3 as a topic for progression in a regional freshwater plan review. We reference it again here to highlight the investigation part of this work needed to inform a plan review. This piece of work requires further definition and costing by Council staff.

13.3.1.4 Development of cultural tohu

Development of cultural tohu (indicators) is raised in the Manawhenua Mātauranga report (MKM 2018). While this work needs to be completed by MKM, FLAG recommend Council support MKM in defining appropriate cultural tohu, because this is needed to complete work on the attributes identified in Section 8 and the definition of appropriate freshwater objectives, particularly to support the Cultural and Spiritual values of water.

13.4 Education and advocacy

Education and advocacy is an important part of implementing our freshwater management framework, and both benefits from, and enables, better Council partnerships with iwi, land owners, industry and community groups.

We understand that Council science and compliance staff undertake education and advocacy regarding discharges and freshwater at every opportunity, but for most this is not their primary role and they are already at capacity. We want Council to seriously consider opportunities for increasing education and advocacy capacity, rather than dismiss it as a 'nice to have, but not necessary' component of your work.

[116] Anecdotal accounts suggest some systems may be discharging directly to karst tomo (caves and open sinkholes), but this has not been confirmed.
[117] A rough order cost, assuming 1 hour per site at a cost of $80 per hour, plus basic reporting.

Experience elsewhere[118] supports the importance of field-based officers or 'knowledge brokers' in building relationships based on trust, and highlights that these roles are central to achieving long term objectives – in particular for the effective and ongoing use and implementation of farm environment plans that address risks to water.

Therefore, we recommend Council recruit dedicated staff to:

1. Work with landowners and industry groups to facilitate and promote good land use practice including:
    a) Facilitating the trial and sharing of good land use practice within and between different industries that is effective and affordable, including discharges management and water use efficiency

2. Work with iwi and stakeholders (including partnering with industry providers) to facilitate and promote waterbody restoration, including:
    a) Facilitating development of an FMU-wide restoration vision and plan
    b) Assisting landowners to achieve riparian and aquatic restoration that implements the shared vision
    c) Assisting stakeholders to apply for external funding to enable more restoration to occur
    d) Assisting stakeholders to make the most of the available funding, for example through the buying power of Council or provision of administration services

3. Provide targeted education resources and advisory services for:
    a) Waterbody restoration and management of waterbodies on farm
    b) On-site wastewater (design, operation and ongoing maintenance)

13.5 Works and services

We understand Council already has some specific projects focused on water management in the Tākaka FMU included in the Long Term Plan, and we support these being progressed, including:

- Catchment management planning for urban stormwater management in Tākaka township
- Investigations and implementation of approaches to improve water quality in Lake Killarney

FLAG members have raised concerns around Council's river channel management, including bank stabilisation and gravel management for flood control, and pest management using herbicides and pesticides. In particular, concerns are that river works have not achieved good aquatic or riparian habitat outcomes. This issue has been reiterated by manawhenua iwi in the Manawhenua Mātauranga Report (MKM 2018), including further reference to the impact of these works on culturally or locally important sites.

We ask that Council review the approaches used in river channel management to ensure they achieve positive outcomes for all values of water in the Tākaka FMU, including Ecosystem Health[119], in addition to the outcomes sought for erosion, flooding, gravel and pest management.

[118] For example AgResearch (Oct 2016) for Horizons Regional Council which highlighted that 'knowledge broker' roles were crucial for uptake of farm environmental plans, and played a central role for realising the long-term potential of those plans as vehicles to implement policy, and generate regional growth.

[119] Which has vital benefits for other values including mahinga kai and fishing

13.6 Financial measures

Council currently provides financial assistance for fencing for stock exclusion (fencing fund) and more recently for catchment improvements (catchment fund), including riparian and aquatic habitat restoration. We support these initiatives and are keen to see these continued, and extended through Council providing staff capacity and resources to assist landowners and the community to attract external funding to further waterbody restoration and stock exclusion efforts in the Tākaka FMU (as per Section 13.4 above).

13.7 Further regulation review

Further review of freshwater regulation at a region-wide level is discussed in Section 12 and referenced here to highlight the need to include this in the Tākaka Freshwater Implementation Plan to ensure this work is programmed to occur.

In addition, there is a public perception that existing compliance efforts are insufficient to protect water health, in particular dealing with non-compliant users. More effort and more transparency are important for improved community confidence in this vital part of the resource management process. Consideration should be given to reviewing the resourcing and efficacy of compliance and enforcement efforts for management of water flows and quality to support the regulatory frameworks.

14 Economic Considerations

One of the fundamental aims of the FLAG process has been to provide for water use by individuals and the Tākaka community to enable them to provide for their economic, cultural and social wellbeing, through the allocation of water where it is sustainably available[120].

In addition, water quality and health is also recognised as key to realising economic, cultural and social wellbeing, as reflected by the other fundamental aims (refer Section 3.1).

We have considered the value of water to the local community from a wide range of perspectives - the benefits of healthy water are captured in the values of water defined in Section 6, and providing for each of these values has been a focus for us throughout our discussions. We have also considered the likely scale of potential costs, of the recommendations made, in seeking to achieve continued water and land use that is sustainable, and several of our key assumptions and philosophies (refer Section 4.3) reflect the intent to seek fairness and to focus effort on minimising costs for all parties.

We have sought economic information to inform our discussions and have found this difficult to obtain, particularly at the FMU scale. We have looked at basic economic information for the dairy industry[121] and sought advice from a local accountant on businesses in the FMU and reviewed employment statistics. Basic information is also available around tourism generally in Tasman and New Zealand[122], but not specifically for Tākaka or Golden Bay/ Mohua. However, this information

[120] This is a requirement under the NPS-FM – objectives A4 and B5

[121] Refer FLAG meeting notes (6 March 2015)

[122] Tourism in Tasman (for the year ending February 2019) had an estimated $297 million spend, with 1% growth year to year (MBIE, 2019). Tourism activity directly generated 8 percent and indirectly 5.5 percent of total employment in New Zealand in 2018, and international tourism provides more expenditure compared to primary exports, including dairy, meat and wool products and fruit (StatsNZ, 2018). Research tells us the natural environment is the primary reason why people visit New Zealand (TIA, 2017).

does not cover the economic importance of healthy water to these industries, or how the benefits of water use flow through to other parts of the community.

The NPS-FM requires that Councils:

- Enable communities to provide for their economic well-being, including productive economic opportunities, in sustainably managing freshwater quality and quantity, within limits[123]
- Consider any implications for resource users, people and communities arising from the freshwater objectives and associated limits, including implications for actions, investments, ongoing management changes and any social, cultural or economic implications. [124]

FLAG consider the recommendations meet the requirements of the NPS-FM with regard to enabling communities to provide for their economic well-being, in providing additional water for use within sustainable limits[125], and providing for protection of water quality through the proposed water quality framework and its associated limits (eg minimum standards and requirement for Risk to Water planning[126]).

We recognise there will be costs from the implementation of our recommendations, both to Council rate payers and individuals, but we believe these are required in order to achieve the benefits sought for ecosystem and waterbody health, now and in the future, including benefits to the values of water that depend on healthy ecosystems.

However, we have not yet obtained specific economic information and analysis to define the costs of implementation, or fully considered how these costs might be minimised or spread over time. We consider Council is best placed to engage this work, in conjunction with affected stakeholders, once Council has considered our proposed framework and the available implementation approaches.

FLAG recommendation 32:
That the Council instruct staff to commission an economic analysis that considers the implementation approaches and costs of the proposed Tākaka FMU recommendations package, including consideration of:

a) The regulatory and non-regulatory aspects,
b) Enabling the Tākaka community to provide for its economic well-being, including productive economic opportunities as required under the NPS-FM (Objectives A4 and B5)
c) The economic value gained or lost to the Tākaka FMU, Golden Bay/Mohua, Tasman region, and New Zealand communities, including the provision for, and protection of, values through:
    i. water left in waterbodies (in situ), and
    ii. water provided for consumptive use
d) How best to manage any financial cost implications of the regulatory and non-regulatory approaches, including identification of:

[123] NPSFM objectives A4 and B5
[124] NPSFM policy CA2 f (v)
[125] For example the allocation limits have been set at ecologically sustainable amounts as recommended by Cawthron and where necessary reduced to provide for other values of water such as in the Upper Tākaka Mainstem and Anatoki zones (refer Section 10.9).
[126] Including the avoidance of duplication of effort for both landowners and Council by seeking to utilise existing industry programs.

e) The costs to Council of fully implementing the new freshwater management regime, including consideration of the options available to meet those costs and co-ordinated financial planning across Council, so that the desired outcomes from the FLAG recommendations (in meeting the NPS-FM) are realised.
f) Direct financial costs and benefits to individuals or sectors of the community. In recognising where those costs and benefits fall, presenting recommended approaches to ease the burden of costs, or require reciprocity for benefits, where it is fair to do so.

We leave it to Council to determine how best to frame the economic analysis to include our recommendations above, alongside any additional requirements you need to fulfil under Section 32 of the RMA, or the NPS-FM. We provide a summary of the key economic questions identified over the FLAG process and a list of potential implementations costs in Appendix 16.9 for your consideration in defining the scope of the economic analysis.

15 Additional Considerations for Council

15.1 Freshwater management

FLAG recommendation 33:

That the Council consider the following issues, and report back to the FLAG and the Tasman community on the outcomes of their consideration, and any resolutions regarding work to address these:

a) Promoting rainwater harvesting, where this will not impact housing affordability
b) Reviewing the effects and management of native tree removal as a result of irrigation or intensification of land use
c) Reviewing the controlled activity status of water renewals (as creating a perpetual right)
d) Investigating options for promoting and implementing utu (reciprocity) for water resource use, so that the benefits received from water use are reciprocated back to local waterbody environments and communities
e) Investigating improvements to the water transfer system to improve and promote water use efficiency
f) Undertaking more reporting back to the community to improve understanding of water resources and their management, to establish greater trust in the work of Council
g) Investigating methods to address concerns around the regulation of specific end uses of water to manage potential effects on water quality, and the 'best use of water' for meeting the community's well-beings
h) Investigating methods to address concerns around offshore or out of region use of local water, with little or no benefit to local communities
i) The options for Council to help improve the management of whitebait
j) Safe public access to waterbodies.

This chapter outlines the remaining matters that FLAG members request Council give specific consideration to regarding freshwater management (as per the recommendation above), and the reasons for this request.

We did not seek a specific group consensus on these topics or seek to define them in any depth. The topics represent matters that arose often during discussions and are of relevance to the management of water health and achieving environmental, social, economic and cultural well-beings. Some are of particular concern to some FLAG members and the Mohua/Golden Bay community, but are either out-of-scope of the FLAG work, or we were unable to address them with

the time and resources we had, because we had to prioritise the essential elements for a plan change at this time. We ask that you review the list of topics in conjunction with the Manawhenua Mātauranga report (MKM 2018), which outlines some of the same topics and others that need further consideration by Council.

FLAG members are willing to discuss these aspects further as needed with the Council.

FLAG raise the following for Council consideration:

1. **Promoting Rainwater harvesting:** (eg individual rainwater tanks), where this will not impact housing affordability. Rainwater harvest is considered to be a cost effective means for domestic water supplies where there are not suitable waterbody sources and some members feel this should be promoted for all new builds.
2. **Review the effects and management of native tree removal:** – in particular that undertaken for irrigation installation. This issue arose out of a concern that certain types of irrigation systems require removal of any trees in the irrigated area and community feedback suggests people value the trees dotted across the pastoral landscape (eg totara) for cultural, amenity and landscape values. Native tree removal could be an unintended consequence of enabling further irrigation in the FMU.
3. **Review Water permits as a perpetual right:** The key concern is that once water permits are granted, the controlled activity status of permit renewals (where Council must grant them) is seen to provide a perpetual right that limit the ability of the community to redirect future use of water to higher-value[127] uses. For others, the substantial financial investment in water use systems requires and validates a level of certainty such as a guaranteed ongoing right to take and use that water (ie controlled activity status on reapplication). Given this is a complex topic and will likely spark regional level discussions, even if limited to the Tākaka FMU, we believe this discussion is best addressed in a region-wide plan review process.
4. **Review reciprocity (Utu):** This concept – that resource users give something back to the environment or community - is promoted by manawhenua iwi and supported by some members of FLAG. The mechanisms and details around how utu might be implemented for those that use water or land in the Tākaka FMU is a complex topic that needs further community discussion, and did not fit within the timeframe for the Tākaka Freshwater Plan Change.
5. **Review improvements to the water transfer system: -** to enable improved water use efficiency. Water transfer systems allow unused water within consented amounts to be shared with other uses for periods of time- for example sharing water with other industries that have different critical water periods. Other Councils (eg Marlborough) are developing online systems for water transfer, which have the ability to streamline the water transfer process so better use is made of allocated water.
6. **Undertake more reporting back to the community:** - in ways they understand and can easily access. The reason for seeking this is to improve community understanding of resource management and establish greater trust in the work of Council, including:
    - how resources are managed
    - the state of resources

[127] Higher value to the community – rather than the individual user

- compliance effort and the results of this effort

7. **Investigating methods to address concerns around the specific end uses of water and "best use of water":** As outlined in Section 10.2, staff advice regarding allocation of water to specific end uses, is that the Council has no clear mandate or mechanisms to control who gains use of local water resources, and that regulation of how water is used (ie enabling only certain end uses) is difficult to establish. While FLAG agreed not to pursue end use controls in our recommendations because of these difficulties, one of the drivers behind wanting lower allocation limits is community perception of end uses and their risk to water quality. We include this issue for further consideration by Council, in conjunction with the associated topics of defining the 'best use of water' for the community's well-beings, and managing off-shore benefit of water discussed further below.
8. **Review offshore use and benefits from local water:** This issue relates to the offshore use and benefit from local water resources, with little or no benefit to local communities or the environment. This issue is of concern to some FLAG members and was a clear message of concern from the Golden Bay/Mohua community during public feedback, plus it echoes national conversations around water. Staff advised FLAG that the Council has no clear mandate or mechanisms to control who gains use of local water resources, or payment of royalties (as with minerals) and this issue needs to be addressed by central government and was therefore out of scope for the FLAG work. FLAG recommend that Council consider this issue further in its discussions with central government, particularly who benefits and who bears the cost of the use of local water resources.
9. **Review Council options for helping to improve management of whitebait:** Whilst we are aware you do not have the mandate for whitebait management, we ask that you initiate discussions with the Department of Conservation and manawhenua on the management of whitebait to avoid over-fishing, and protect and restore white bait spawning habitats.
10. **Safe public access to waterbodies:** During FLAG discussions public access was raised as an important indicator of whether some values of water are provided for, such as Recreation, Fishing, Food and Resource Gathering, and Cultural and Spiritual Values. Addressing public access was considered out of scope regarding the FLAG focus on water quantity and quality characteristics. However, safe public access, in appropriate locations, is something that should be considered by Council in the wider provision for the values of water.

15.2 Collaborative processes

We understand that staff will be reflecting on the process we have collectively been through before undertaking further policy and planning work to meet the requirements of the NPS-FM, including how to carry through what worked well in the collaborative community based planning approach and how to address the aspects that didn't work well. Staff and the independent facilitator will have their own perspectives on this. Below are FLAG members' perspectives on what worked well and what didn't, as a contribution to any similar processes in the future.

What worked well:

- The commitment and perseverance of group members over a long time period with many members investing their time and energy voluntarily
- A very good mix of people, who have treated each other well – "I felt able to be true to myself in this process", "I sincerely like coming to work with this group of people"

- The existing skills and knowledge that each person contributed to the group, both in relation to water management and the ability to work collaboratively, and the willingness to develop these and learn throughout the process
- The support from Council staff– consistently high quality administrative support and information and knowledge sharing
- The calibre of Council and consultant scientists – good sharing of the science and FLAG members being able to understand and use it
- Good learning – "I feel like I've earned an honorary degree"
- Consensus approach good, but challenging – a new type of decision making approach compared to majority voting, which has been good to experience
- Realising that we are all coming from different perspectives, but all heading the same way - everyone wants the same thing for freshwater and wants it looked after so that it remains healthy and unpolluted
- Good facilitation – kept us focused on achieving an outcome and doing so in a respectful way – everyone can leave with their mana/integrity intact
- Dealt with the NPS-FM in a realistic human way
- Happy with the alignment between FLAG's proposals and the MKM report
- It was good to be able to share what FLAG was learning and doing with the farming community - Good being a conduit between FLAG and farmers
- Proud of output – good to be looking at the bigger picture, bringing all the pieces together – good to be part of a change, a solution

What did not work well:

- The process was too long– 'got to quit while we're all still alive!'
- More of a commitment and effort than I expected - juggling FLAG with other commitments - some members not paid to attend
- Think we have underplayed the values – we reached a strong consensus on these
- Difficulty without economic analysis – need further work on this
- Public communications and public engagement – people in our community made it personal, FLAG members and individuals had their integrity questioned and felt personally attacked, which was a hard time for FLAG members and science advisors - Council needs to learn from this and conduct the consultation involved with any future FLAG style processes differently
- Social media spread mis-information, which is difficult, if not impossible, to manage
- Iwi engagement – needs to occur earlier in the process
- WCO process potentially eclipsing some of FLAG work – concern WCO is not a local process
- Concern about future changes to the recommendations package

FLAG Recommendation 34:
That the Council consider the lessons learnt from the Tākaka FLAG process, from FLAG members, iwi, staff, the independent facilitator and survey work by Landcare Research[128], in the development and implementation of any future collaborative community processes, with the aim of improving staff resourcing, reducing project timeframes, and improving the processes around public, stakeholder and iwi engagement.

[128] *This research occurred as part of the "Our Land and Water" Collaboration Lab project run by Landcare Research to improve collaborative processes for freshwater planning and implementation.*

Part 3:
Appendices

16 Appendices

16.1 Glossary and abbreviations

Term	Definition
AMA	Arthur Marble Aquifer – note to avoid confusion, the abbreviation AMA is avoided wherever possible as the TRMP already uses this abbreviation regarding the Aquaculture Management Areas.
CDOM	Coloured Dissolved Organic Matter
Confined aquifer	Confined aquifers are those in which an impermeable dirt/rock layer exists that prevents water from seeping into the aquifer from the ground surface located directly above.
Consumptive water use	A water use that takes water from a water body and does not return it to that same water body – eg a water take for irrigation
Council	Tasman District Council
DoC	Department of Conservation
DOC	Dissolved Organic Carbon
FLAG	Tākaka Freshwater and Land Advisory Group
FMU	Freshwater Management Unit
FoGB	Friends of Golden Bay
Hau kāinga	local people of a marae, home people
hui	meeting
Iwi	Extended kinship group, tribe- often refers to a large group of people descended from a common ancestor and associated with a distinct territory
Kainga	Home, settlement, dwelling
L/s	litres per second
Mahinga harakeke	Flax gathering site
Mahinga kai	Food and resource gathering or cultivation site
MALF (7day)	Mean Annual Low Flow –the average of the lowest flows in each hydrological year of data (for a 7day MALF the low flow in each year is determined from a running average over 7 days).
Mana	Authority / power [*Mana can be described as the mandate or authority to manage, control and maintain relationships with ngā taonga (sacred resources) in the rohe. Mana is gained through whakapapa (genealogy), but can also be earned or acquired through raupatu (conquest). For example, the mana of a tribe increases with the wise management and use of natural resources within their rohe.* Source MKM 2018]
Mātauranga	Traditional knowledge [*Traditional and present day mātauranga (knowledge). Mātauranga originates from nga tūpuna and includes cultural perspectives of the world, manawhenua creativity and cultural practices relating to both the spiritual and natural*

	world. Mātauranga is an evolving body of knowledge, ever growing and expanding over time. One way in which mātauranga is communicated from one person to another and from one generation to another is through Waiata (song). There are many types of waiata; some contain information on whakapapa, others contain beliefs concerning the atua, and some provide guidance on tikanga. Mātauranga is also passed between people through the use of Karakia (prayer) and Whakatauki (proverbs). Source MKM 2018]
Mauri	Life force. *[Mauri is often described as 'life force" or "life principle' of a place or being. It is an expression of the hauora (health) of that place or being. Mauri is derived from Io (the creator of all things) and gives being and form to everything in the universe. Wairua (spirit) is closely associated with mauri, because the spiritual and physical body is joined together as one by the mauri. Therefore everything has a mauri, including tangata (people), whenua (land), moana (sea), awa (rivers), ngāhere (forests), ika (fish), manu (birds) and ngārara (insects). All life has spiritual and physical elements – tangible and intangible – all of which are essential for wellbeing. Tohu (indicators) include the presence and abundance of species, fit for all cultural purposes. The presence of mauri in all things entrusts manawhenua to appreciate and respect wāhi taonga (sacred resources) and try to protect, restore and enhance the mauri of all living things.* *Life force, vital essence, special nature – a material symbol of a life principle, source of emotions; the essential quality and vitality of a being or entity. Also used for physical objects, individuals, ecosystems or social groups in which this essence is located. Mātauranga (knowledge) and associated practices are based on managing ngā taonga to sustain their hauora (health) – to sustain their mauri (life force) and protect their wairua (spiritual essence) for future generations. Source: MKM 2018]*
MfE	Ministry for the Environment
mg/L	Milligrams per litre
MKM	Manawhenua Ki Mohua
MPI	Ministry of Primary Industries
NOF	National Objectives Framework – part of the NPS-FM
Non-consumptive water use	A water use that takes water from a water body for temporary use before returning it to the same water body – eg a water take for power generation

NPS-FM	National Policy Statement for Freshwater Management
Tapu	Sacred [*A person, place or thing that is prohibited, restricted, set apart, forbidden or under atua protection is Tapu – Tapu removes the person, place or thing from the sphere of the everyday into the sphere of the sacred. Traditionally, Tapu was used as a way to control how people behaved towards each other and the environment, placing restrictions upon society to ensure that people flourished. Rangatira and tohunga (acting as channels for the atua) could apply tapu; these restrictions can be removed with water food or karakia (prayer) Ngā taonga in the natural world all originate from one of the atua and therefore to appease the atua, karakia were are carried out before and after harvesting. When tapu is removed, things become noa – a process called whakanoa.* Source MKM 2018]
Te Waikoropupū	Te Waikoropupū – includes all waterbodies within the DoC reserve boundary, including the main spring basin, Dancing Springs, Fish Creek Springs, Springs River and Fish Creek.
Tūpuna	Ancestors
Unconfined aquifer	Unconfined aquifers are those into which water seeps from the ground surface directly above the aquifer.
Urupā	Māori burial ground
Utu	Reciprocity [*Utu refers to the maintenance of balance and harmony in relationships between individuals and groups. It is closely linked to mana and relates to reciprocity of all deeds. Gift exchange is a major component of utu, creating reciprocal obligations on the parties involved and establishing permanent and personal relationships.* Source MKM 2018]
Wai	Water
Wairua	Wairua is intertwined with mauri and together they influence the hauora of wai. [Refer also the definition for mauri]
Whakapapa	Ancestry *[Genealogy connections are the basis of all relationships. Every living thing is related through whakapapa. It is customary practice when speaking in formal settings for manawhenua to identify where they come from in relation to other iwi, as well as recite the relationship that connects them to the natural world – such as the whenua (land),*

	maunga (mountains) and awa (rivers). This practice reinforces the belief that all things have the same origin and that the wellbeing of the whole environment determines the wellbeing of manawhenua. Source: MKM 2018]
whānau	Extended family, family group.

Note Te Reo translations in this glossary have been obtained from Manawhenua ki Mohua or the māori dictionary online at https://maoridictionary.co.nz

16.2 References

Ref in text	Reference description
AgResearch 2010	Land use and land management risks to water quality in Southland - Report prepared for Environment Southland. R.M. Monaghan, A. Semadeni-Davies, R.W. Muirhead, S. Elliott and U. Shankar. AgResearch, April 2010
Aqualinc 2017	Tākaka Valley Groundwater Modelling Technical Investigations. Prepared for MBIE Wheel of Water Research (project C15066-03) by Julian Weir (Aqualinc) and Andrew Fenemor (Landcare Research), Aqualinc, 15 December 2017.
Cawthron Jan-2017	Framework for Setting Water Allocation Limits and Minimum Flows for Tākaka - Cawthron Report 2977 - January 2017
Cawthron Mar-2017	Ecosystem Health of Te Waikoropupū ('Science Panel Report') - Cawthron Report 2949 - March 2017
DoC 2009	Te Waikoropupū Springs Management Plan – Department of Conservation, March 2009.
Edgar 1998	Hydrology of the Tākaka Valley Msc, University of Canterbury, 303p. Edgar, J.E., 1998.
ESR (Draft - date unknown)	(DRAFT) Sheep as a Potential Source of Faecal Pollution in Southland Waterways. Prepared For: Environment Southland, E. Moriarty ESR Client Report No: CSC17002.
Fenemor 2018	*Fenemor, A.D. (ed) 2018. Water quality expert conferencing joint report to the Special Tribunal considering a Water Conservation Order for the Te Waikoropupū Springs and associated water bodies. Prepared for EPA. 6p.* *Fenemor, A.D. 2018. Brief of Evidence, Summary Evidence, Supplementary Evidence and Slides for the Tribunal Hearing of an Application for a Water Conservation Order for Te Waikoropupū Springs. Prepared for Tasman District Council. 42p, 8p, 23p. https://www.epa.govt.nz/database-search/rma-applications/view/NSP000042?accordion-anchor=Evidence - Submitter's evidence*
Fenemor, Markham and Thomas 2017	Current informal water allocation limit for the recharge zone of Te Waikoropupū Springs - Memo: Fenemor, Markham and Thomas, March 2017.
Fenwick 2016	Sustainability of Te Waikoropupū Springs' aquifer ecosystems - G.Fenwick - NIWA, corrected July 2016
FLAG 2016	Tākaka Freshwater and Land Advisory Group, Summary of Interim Decisions for Water Quantity and Quality Management in the Tākaka Freshwater Management Unit, November 2016 (updated 16 Dec 2016)

FoGB 2018 (interim data)	Nitrate monitoring data at Waikoropupū (interim results) – A.Yuill on behalf of Friends of Golden Bay, 2016-18 *(Council staff advise that in line with data management protocols, laboratory analysis forms have been requested from Andrew Yuill to enable use of this data as a verified data set)*
Ford & Williams 2007	Karst Hydrogeology and Geomorphology. D. Ford, McMaster University, Canada and P. Williams, University of Auckland, New Zealand. Publisher John Wiley & Sons Ltd, 2007.
GNS 2001	Hydrogeology of the Tākaka River Catchment and assessment of the effects of Cobb Power Station operation on groundwater in the catchment (refer chapters 2 and 3), GNS 2001.
Hickey 2015	Hardness and Nitrate Toxicity - site specific guidelines for spring-fed streams (Waimea, Motupipi, Te Waikoropupū) (Memo: C.Hickey - NIWA, May 2015)
MBIE 2019	Monthly Regional Tourism Estimates (MRTEs), Ministry of Business, Innovation and Employment (MBIE), February 2019. Online source: https://www.mbie.govt.nz/immigration-and-tourism/tourism-research-and-data/tourism-data-releases/monthly-regional-tourism-estimates/
MfE 2018	A Guide to Communicating and Managing Uncertainty when Implementing the National Policy Statement for Freshwater Management 2014. Ministry for the Environment, December 2018.
MKM 2018	Manawhenua Mātaranga Report for the Tākaka Catchments – Manawhenua ki Mohua, June 2018
Mueller 1991	Karst hydrogeology of the Tākaka Valley, Golden Bay, northwest Nelson. Journal of Geology and Geophysics 34, 11-16. Mueller, M. 1991
Mueller 1992	Geohydrology of the Tākaka Valley, Nelson-Marlborough Regional Council, 49p. Mueller, M., 1992.
NIWA 2018	Continuous Water Clarity Monitoring in Te Waikoropupū Springs, Prepared by Mark Gall, NIWA, for Tasman District Council, April 2018.
NPS-FM	National Policy Statement for Freshwater Management (NPS-FM) 2014 (amended 2017)
Settlement Acts 2014	These Acts include: • Ngāti Apa ki te Ra To Ngāti Kuia and Rangitane o Wairau Claims Settlement Act 2014 • Ngāti Koata Ngāti Rarua Ngāti Tama ki Te Tau Ihu and Te Atiawa o Te Waka a Maui Claims Settlement Act 2014 • Ngāti Toa Rangatira Claims Settlement Act 2014
Stark 2015	The Nutrient Status of Waikoropupū Springs with particular reference to Nitrate-N levels - Stark Environmental, April 2015
StatsNZ 2018	Tourism satellite account: 2018 - The contribution made by tourism to the New Zealand economy. Statistics New Zealand 2018 – Retrieved (by MBIE) from www.stats.govt.nz
Stewart & Thomas 2008	A conceptual model of flow to the Waikoropupū Springs, NW Nelson, New Zealand, based on hydrometric and tracer (18O, Cl, 2H and CFC) evidence. Hydrology and Earth System Sciences 12, 1-19, 2008. Stewart, M.K., Thomas, J.T. 2008.
Stewart & Thomas 2017	Optimisation of water flow model for Arthur Marble Aquifer and Te Waikoropupū Springs - Memo: Stewart and Thomas, March 2017

Stewart 2018	Brief of Evidence of Michael Kilgour Stewart 4 April 2018. For the hearing for the Water Conservation Order at Te Waikoropupū Springs and associated water bodies
TDC 2007-15	Motupipi Estuary Reports. Tasman District Council – available on Council's website.
TDC 2009-14	Bathing Water Quality End-of-Season Reports (since 2009) - available on Council's website.
TDC 2010	State of the Environment – Groundwater Quality in Tasman District 2010 (refer also memo update to EPC on 3 August 2017 on 2016 Tākaka groundwater synoptic survey results).
TDC 2015	State of the Environment – River Water Quality Report Part 4 – Tākaka Water Management Area. Tasman District Council 2015
Thomas & Harvey 2013	Water Resources of the Tākaka Water Management Area. Tasman District Council. J T Thomas, M M Harvey July 2013.
TIA 2017	Presentation to Economic Exchange – Importance of Water to Tourism: Industry Perspective, 26 April 2017, B. Bassett. Tourism Industry Aoteaora (TIA)
TRMP	Tasman Resource Management Plan (2008-2014)
Urlich 2002	Land use in karst terrain: review of impacts of primary activities on temperate karst ecosystems Science For Conservation 198, Peter B. Urich. Published by Department of Conservation, 2002.

16.3 Attributes for Freshwater Objectives

The attributes considered by council staff have included those identified by FLAG, those required under the NPS-FM, and additional attributes identified by science staff as being important for integrated understanding (for example temperature which is important for understanding other attributes such as dissolved oxygen and nuisance plant growth). The attributes have been considered across different water body types including rivers, lakes, aquifers, wetlands and estuaries. Specific attributes for Te Waikoropupū Springs are defined in Section 7.2.

The following tables summarise the attribute units/metrics and statistics for use in determining numeric freshwater objectives. This work is still being finalised by council staff and covers:

- Aquifers
- Rivers
- Lakes
- Wetlands and Estuaries

Table 11 DRAFT – AQUIFERS - Attribute Units and Statistics applicable in the Tākaka Freshwater Management Unit

FLAG attribute	Sample Parameters	Metric/Unit	Statistics	Method	Method standard or guideline	Sample Timing and Context	Frequency	Existing or new monitoring
Dissolved oxygen	Temperature	Degrees Celsius	Annual median	Grab sample with probe	NEMS	Anytime (and when testing DO)	quarterly	existing
	Dissolved oxygen	Percentage Saturation (%)	Annual median	Grab sample with probe	NEMS	anytime	quarterly	existing
	Chemical Oxygen Demand	mg/L	Maximum single sample	Grab sample & lab test	APHA	Anytime	Only if issue identified with ammonia	new (but only as needed)
	Biological Oxygen Demand	mg/L	Maximum single sample	Grab sample & lab test	APHA	Anytime	Only if issue identified with ammonia	new (but only as needed)
Macro Invertebrates	Macro-invertebrates	ID	ID	ID	ID	ID	ID	New no recognised method yet (ESR doing research)
Nutrients	Dissolved Inorganic Nitrogen (for aquatic growth)	mg/L (nitrate + nitrite)	Annual median & 95th percentile	Grab sample & lab test	APHA	Anytime	Quarterly	existing
	Dissolved Reactive Phosphorus (for aquatic growth)	mg/L	Annual median & 95th percentile	Grab sample & lab test	APHA	Anytime	Quarterly	existing
	Nitrate (for toxcity)	$mgNO_3$-N/L	Annual median & 95th percentile	Grab sample & lab test	APHA and Hickey (2015)	Anytime	Quarterly	existing
	Ammonia (for toxicity)	mg NH_4-N/L	Annual median & Annual Maximum / 95%	Grab sample & lab test	APHA	Anytime	Only if issue identified with a high risk activity or discharge	Existing (but only as needed)
Microbial pathogens	E.coli for drinking water supply without treatment	E.coli per 100mls	Maximum Acceptable Value	Grab sample & lab test	APHA	Anytime	(Registered water supplies) Synoptic (10yrly) More frequently if issue identified.	existing
Nutrients	Nitrate for drinking water supply without treatment	$mgNO_3$-N/L	Maximum Acceptable Value	Grab sample & lab test	APHA	Anytime	Quarterly	existing
Groundwater level	Groundwater level	Metres above mean sea level	Envelop diagram	NEMS	NEMS	NEMS	NEMS	existing
		positive pressure above mean sea level	Envelop diagram	NEMS	NEMS	NEMS	NEMS	Existing
Mauri	tbc	tbc	tbc	tbc	tbc	tbc	tbc	New

Table 12 DRAFT – RIVERS - Attribute Units and Statistics applicable in the Tākaka Freshwater Management Unit

FLAG attribute	Sample Parameters	Metric/Unit	Statistics	Method	Method standard or guideline	Sample Timing and Context	Frequency	Existing or new monitoring
Water clarity	Water clarity	Meters (m)	Annual Median Annual 10th percentile	Black Disc Visual	NEMS	Year round (at baseflow)	Monthly (only baseflow ones analysed)	existing
Dissolved Oxygen	Dissolved oxygen	Percentage Saturation (%)	Daily minimum	Sonde data (at least 3 days)	NEMS	3 days, continuous 15min, at baseflow	High risk waterways and generally only if issue identified with spot measurements.	Existing (only in high risk catchments). Refer sonde deployment programme
		g/m^3	7-day mean minimum	Sonde data (at least 3 days)	NEMS	3 days, continuous 15min, at baseflow	As above	As above
		g/m^3	Lowest 1-day minimum	Sonde data (at least 3 days)	NEMS	3 days, continuous 15min, at baseflow	As above	As above
	Chemical Oxygen Demand	mg/L	Maximum single sample	Grab sample & lab test	APHA 5220D	Anytime	Only if issue identified	New but only if issue identified with ammonia or signficant point source discharge
	Biological Oxygen Demand	mg/L	Maximum single sample	Grab sample & lab test	APHA 5210	Anytime	Only if issue identified	As above, but only applied to discharges of biological waste
Macro-invertebrates	Macro-invertebrates	MCI (unless other index more appropriate)	Mean of 5 samples - Relative Seasonal Kendall Slope Estimate (RSKSE)	Kick net Protocol C1 for sample collection and P1 for sample processing	Stark et al (2001)	Any time At baseflow In riffles	Annually	Existing
Nutrients	Dissolved Inorganic Nitrogen (for aquatic growth)	mgNO3-N/L	Maximum and median during accrual period	Grab sample & lab test	APHA4500-NH4N + APHA 4500-NOxN NEMS	Early morning prior to photosynthetic consumption	Monthly over summer if issue identified with periphyton cover	Existing, but only if issue identified with periphyton cover
	Dissolved Reactive Phosphorus (for aquatic growth)	mg/L	Maximum and median during accrual period	Grab sample & lab test	APHA 4500-P G NEMS	Early morning prior to photosynthetic consumption	Monthly over summer if issue identified with periphyton cover	Existing, but only if issue identified with periphyton cover
	Nitrate (for toxcity)	$mgNO_3$-N/L	Annual median & 95th percentile	Grab sample & lab test	APHA4500-NO3 I for lab method and Hickey (2015) for correction factor for hardness	Anytime	Monthly	Existing
	Ammonia (for toxicity)	mg NH_4-N/L	Annual median & Annual Maximum	Grab sample & lab test	APHA4500-NH3	Anytime	Monthly	Existing
Microbial pathogens	E.coli for primary contact	E.coli per 100mls	Annual median & 95 percentile (refer NPSFM)	Single grab sample & lab test	APHA9221 F NEMS	Over use period of representative primary contact sites. All flows	Weekly over recreational use period. Daily if trigger hit	Existing
	Planktonic Cyanobacteria for primary contact (Lake fed rivers only)	mm3/L	80th percentile (minimum 12 samples in 3 yrs)	Grab sample & lab test	Wood et al 2009	Over primary contact site use period	Weekly over use period Only if problem identified in lake	Existing, but only if problem identified in lake

FLAG attribute	Sample Parameters	Metric/Unit	Statistics	Method	Method standard or guideline	Sample Timing and Context	Frequency	Existing or new monitoring
	Benthic Cyanobacteria (for human & animal health)	Percentage benthic cover (%)	Max single sample	Bathyscope	Wood et al 2009	Dec-April	Weekly over summer (Dec-April)	Existing at a few selected sites only
Nuisance and Pest Plants	Periphyton Chlorophyll-a (for trophic state)	Chlorophyll-a (mg chl-a/m3)	% of samples	QM 1b or QM 2	Biggs & Kilroy 2000	Oct – April for minimum 3 years At baseflow (antecedent flows)	Monthly Only if issue identified with periphyton % cover (Oct-April)	New, but only if issue identified with periphyton % cover (as per MfE guidance)
	Periphyton cover	Percentage cover (%)	Non-winter Maximum Percentage score	RAM2 using bathyscope	Biggs & Kilroy 2000	Oct – April At baseflow (antecedent flows)	Monthly	Existing
	Macrophyte cover	Channel cross-sectional area/volume occupied (CAV)	Non-winter Maximum Percentage score	Visual	Collier, Kelly and Champion (2007) Regional guidelines for ecological assessments of freshwater environments	Oct – April At baseflow (antecedent flows)	Annually in Feb-Mar	New, but only if issue identified ie close to or greater than 50% cover
Fine sediment	River bed: Resuspendable solids (SBSV) and Suspendible Inorganic Sediment (SIS)	River bed: Resuspendable solids (SBSV) and Suspendible Inorganic Sediment (SIS)	Mean of 5 samples (each sample based on the mean of 6 replicates)	SBSV and SIS	Clapcott et al 2011	Any time At baseflow	Annually	Existing
Contaminants	Zinc (in Sediments)	mg/kg	Maximum single sample	Sediment grab sample & lab test	US-EPA 200.2	Anytime Urban	Annually	New, only in waterways affected by urban land use
	Chromium (in Sediments)	mg/kg	Maximum single sample	Sediment grab sample & lab test	US-EPA 200.2	Anytime Urban	Annually	New, only in waterways affected by urban land use
	Total Poly Aromatic Hydrocarbons (in Sediments)	mg/L	Maximum single sample	Sediment grab sample & lab test	US-EPA 200.2	Anytime Urban	Annually	New, only in waterways affected by urban land use
Riparian and Aquatic Habitat	Riparian & Aquatic habitat	Rapid Habitat Assessment Score	Score out of 100	Rapid Habitat Assessment 2015	Clapcott 2015	Anytime	5 yearly	New (has only been done for Richmond waterways)
	Shading of water	Percentage cover (%)	Percentage (non-winter)	Densiometer	Harding et al 2009	Oct-April at baseflow	5 yearly	New
	Water Temperature	Degrees Celsius	Mid-point between daily mean and daily max	Sonde data (3 days continuous)	Rutherford et al	Dec-April 3days continuous, 15min samples. At baseflow	Only if issue identified: (Dec-April) (only baseflow analysed)	Existing (only in high risk catchments). Refer sonde deployment programme.
mauri	tbc	tbc	tbc	tbc	tbc	tbc	tbc	New

Table 13 DRAFT – LAKES - Attribute Units and Statistics applicable in the Tākaka Freshwater Management Unit

FLAG attribute	Sample Parameters	Metric/Unit	Statistics	Method	Method standard or guideline	Sample Timing and Context	Frequency	Existing or new monitoring
Water clarity	Water clarity	Meters (m)	Annual Mean 5 percentile	Secchi Disc	NEMS	Year round (at baseflow)	Monthly (only baseflow ones analysed)	Existing
Aquatic Habitat	Trophic Index	Index units	Annual average from 3 complete years of data	Calculated from total nitrogen, total phosphorus, water clarity, and chlorophyll-a	Burns et al 2000	Year round	Monthly	New
Nutrients	Ammonia (for toxicity)	mg NH_4-N/L	Annual median & Annual Maximum	Grab sample & lab test	APHA4500-NH3	Anytime	Monthly	Existing
Microbial pathogens	E.coli for primary contact	E.coli per 100mls	Annual median & 95 percentile (refer NPSFM)	Single grab sample & lab test	APHA9221 F NEMS	Over use period of representative primary contact sites. All flows	Weekly over use period. Daily if trigger hit	Existing
	Planktonic Cyanobacteria for primary contact	mm3/L	80th percentile (minimum 12 samples in 3 yrs)	Grab sample & lab test	Wood et al 2009	Over primary contact site use period	Weekly over use period Only if problem identified in lake	Existing, but only if problem identified in lake
Nuisance and Pest Plants	Periphyton Chlorophyll-a (for trophic state)	Chlorophyll-a (mg chl-a/m3)	Annual Median & Annual Maximum	Grab sample	Wood et al 2009	Oct – April for minimum 3 years	Monthly	New, but only if issue identified with periphyton % cover (as per MfE guidance)
	Submerged Plant Indicators (LakeSPI)	Index units	% of a lake's maximum scoring potential.	Composition of native to invasive plants along depth gradient	Clayton and Edwards 2006	Summer to Autumn (Dec-April) (antecedent flows)	Annually but frequency of survey will vary depending on management objectives, a lake's current condition and vulnerability to change.	Existing, but only if problem identified in lake
Contaminants	Zinc (in Sediments)	mg/kg	Maximum single sample	Sediment grab sample & lab test	US-EPA 200.2	Anytime Urban	Annually	Existing, but only if problem identified in lake
	Chromium (in Sediments)	mg/kg	Maximum single sample	Sediment grab sample & lab test	US-EPA 200.2	Anytime Urban	Annually	Existing, but only if problem identified in lake
	Total Poly Aromatic Hydrocarbons (in Sediments)	mg/L	Maximum single sample	Sediment grab sample & lab test	US-EPA 200.2	Anytime Urban	Annually	Existing, but only if problem identified in lake
mauri	tbc	tbc	tbc	tbc	tbc	tbc	tbc	New

Figure 13 DRAFT – WETLANDS and ESTUARIES - Attribute Units and Statistics applicable in the Tākaka Freshwater Management Unit

FLAG attribute	Sample Parameters	Metric/Unit	Statistics	Method	Method standard or guideline	Sample Timing and Context	Frequency	Existing or new monitoring
Wetlands - Metrics and Statistics								
Riparian and Aquatic Habitat	Wetland Condition Index	tbc	tbc	tbc	tbc	tbc	tbc	New
mauri	tbc	tbc	tbc	tbc	tbc	tbc	tbc	New
Estuaries - Metrics and Statistics								
Riparian and Aquatic Habitat	Estuarine Trophic index	tbc	tbc	tbc	tbc	tbc	tbc	New
Microbial pathogens	Total load – E.coli	tbc	tbc	tbc	tbc	tbc	tbc	New
Fine Sediment	Total load - Sediment	tbc	tbc	tbc	tbc	tbc	tbc	New
mauri	tbc	tbc	tbc	tbc	tbc	tbc	tbc	New

16.4 Te Waikoropupū and Arthur Marble Aquifer - further information

This section sets out supplementary information on the geomorphology and hydrology of Te Waikoropupū and the Arthur Marble Aquifer, concerns about possible risks to the waters of Te Waikoropupū, and summarises all of the FLAG's recommended provisions and management regime for Te Waikoropupū - further information is available in Thomas and Harvey, 2013 and Stewart and Thomas, 2008.

16.4.1 Overview

The Arthur Marble Aquifer (AMA) is a very large aquifer that covers an area of around 260km^2 (around 180km^2 unconfined, and ~80+km^2 confined). The thickness of the marble is variable and is considered to be at least 500m and possibly 1000m.

The aquifer has an unconfined area to the south where surface and soil water can flow into the aquifer, and a confined area to the north that is separated from overlying aquifers and surface waters by an impervious geological layer that prevents interaction with the aquifer. The boundary between the unconfined and confined areas crosses the Tākaka valley approximately from East Tākaka through Hamama (refer Figure 2, Section 5).

Contaminants can discharge into the aquifer through direct river recharge or from diffuse infiltration through soils overlying the unconfined part of the aquifer. This water can then move through the aquifer into the confined parts of the aquifer and subsequently out at Te Waikoropupū springs or the sea.

Water in the aquifer is not thought to be uniformly mixed, either vertically or horizontally, and water (including contaminants) is likely to follow various pathways through the aquifer depending on localised conditions, however these pathways are not known.

A conceptual flow model[129], based on flow, chloride and isotopic measurements, suggests two different flow systems with different recharge sources to explain the flow within the Arthur Marble Aquifer. One system contains deeply penetrating old water with a mean age of 10.2 years and water volume of 3 km^3, recharged from the karst uplands on the sides of the valley. The other, at shallow levels below the valley floor, has much younger water, with a mean age of 1.2 years and water volume of 0.4 km^3, recharged by the upper Tākaka River and valley rainfall. These systems are recharged from three sources – the karst uplands, the upper Tākaka River and valley rainfall. These contribute 76%, 17% and 6% respectively to Te Waikoropupū main spring, and 20%, 53% and 28% respectively to the Fish Creek Springs. The model also estimates 58% of the Tākaka River contribution bypasses the springs and is discharged offshore (Stewart 2018).

The age of waters in the Arthur Marble Aquifer (10.2 and 1.2 years, with an average of approximately 8 years) means that there is a potential lag (of up to 10 years) in seeing the effects of land use on water quality at the springs. This has caused concern about the management of water quality, for example a concern that irreversible effects may be caused before they are measureable at the springs.

Te Waikoropupū springs is the main surface outflow (approximately two thirds) of the Arthur Marble Aquifer (the rest – approximately one third - flowing out to sea).

[129] Refer Stewart 2018 and Stewart and Thomas (2008)

Te Waikoropupü springs and the Scenic Reserve are of outstanding natural, cultural, historic and scenic value, both nationally and internationally. In particular, it is renowned for having some of the clearest freshwater in the world. They are a precious taonga (treasure) to iwi and many others in the wider community. Te Waikoropupü springs are a registered wāhi tapu (sacred place) under the Historic Places Act 1993.

Management plans for the springs have been developed in 1985, 1996 and the latest in 2009 by the Department of Conservation in consultation with Manawhenua ki Mohua and the Council. The current policy within the TRMP supports the implementation of the Management Plan[130].

16.4.2 Catchments contributing flow to Te Waikoroupupu

From research[131] into the various contributions to groundwater and flows at Te Waikoropupū springs it has been estimated that the catchments contribute varying amounts of flow, both to groundwater and to contribution of flow at Te Waikoropupū springs – and that these contributions vary depending on the aquifer and river conditions at the time:

- Water released from the **Cobb Dam** for power generation purposes has a significant effect on flows in the Upper Tākaka River and subsequently on flows at the springs. The 7-day MALF at the main spring is 7661 L/s. Aqualinc have estimated that the 7-day MALF in the main spring is increased by 790 L/s (~11%) by water released from the Cobb Dam.
- The **Tākaka River** can lose up to 100% of flow to groundwater, with the river going dry below Lindsay's Bridge, however estimates range from 47-55% (Mueller vs Edgar) of flows influencing Te Waikoropupū springs flow.
- The **Waingaro River** both loses and gains water, and the net loss to groundwater is estimated to be 0% to 12% (ie 6% ± 6%), depending on groundwater and river flow conditions.
- The **Anatoki River** both loses and gains water to groundwater, but not over the unconfined part of the AMA, and comparison of river flows with flows at Te Waikoropupū springs show the Anatoki River is not a source of recharge to the springs, as increased flows in the Anatoki River do not show any related increase in flow at the springs.

This information has been used to inform the catchment accounting for the allocation regime in the Arthur Marble Aquifer Recharge zone – refer Section 16.6.6.

16.4.3 Water quality and ecological monitoring

Water quality for the springs has been measured as part of the Council groundwater State of the Environment monitoring programme since 1990. This looks at groundwater attributes, and does not include surface water related attributes, such as water clarity, macro-invertebrates and aquatic plants.

Expert advice on these attributes has been sought as part of the FLAG process to better understand current water quality. That advice is summarised in the following reports:

- The Nutrient Status of Waikoropupū Springs with particular reference to Nitrate-N levels - Stark Environmental, April 2015 (which also included review of macroinvertebrates and aquatic plants in Springs River)

[130] Refer TRMP policy: 27.6.1.7, 27.6.3.2, 28.3, 28.4, and Sch.30A
[131] Refer GNS 2001, Edgar 1998, Mueller 1991 and 1992, Stewart & Thomas 2008, Thomas and Harvey 2013.

- Ecosystem Health of Te Waikoropupū ('Science Panel Report') - Cawthron Report 2949 - March 2017
- Continuous Water Clarity Monitoring in Te Waikoropupū Springs - NIWA, April 2018.

Environmental Science and Research (ESR) has carried out a trial on groundwater ecology investigation techniques, including in the Tākaka catchments, but has yet to undertake more substantive work specifically in the Tākaka Valley aquifers and in Te Waikoropupū Springs directly.

The Department of Conservation is responsible for the administration of the springs and surrounding reserve and has undertaken some monitoring of aquatic plant growth in the springs. The 2009 Te Waikoropupū springs Management Plan outlines the objectives, policies and methods regarding management of the springs and reserve, including management of aquatic plant pests.

16.4.4 Nitrate sources

While nitrate levels are generally low in most of the surface and ground waters in the Tākaka catchments, there is an agreed FLAG assumption that a portion of the nitrate measured in Te Waikoropupū springs is coming from productive land use in the valley.

Information available to FLAG was insufficient to confidently attribute portions of observed nitrate in receiving water bodies to specific land uses or locations, but catchment modelling and use of research data from elsewhere on both human and natural sources of nitrate, can be used to give estimates of the likely attributive sources of nitrate in the catchment.

Catchment modelling has been undertaken by Aqualinc (2017) and subsequently reviewed and discussed by the FLAG Nitrate Subgroup - a subset of FLAG members and staff set up to look more in-depth at the issue of nitrate and nitrate sources.

Previous consideration of the potential sources and possible contributions of nitrate within the Tākaka catchments[132] has highlighted the following possible contributions:

- *irrigated dairy land use (valley): 34%*
- *dryland dairy and lower intensity farming (valley): 53%*
- *bush and forestry: 6%*
- *native grassland and scrub: 6%*
- *other natural sources (eg aquifer rock): currently assumed 0%*

Significant uncertainty exists and the model is required to make key assumptions including that the water quality in the aquifers is uniformly mixed, with no attenuation of nitrate within the system.

Discharges of nitrate from some point sources are already managed by discharge rules in the TRMP. The diffuse generation and transport of nitrate into waterbodies is expected to be considered within the minimum standards and Risk to Water framework recommended by FLAG (refer Sections 11.2 and 11.3). FLAG anticipates that the recommendations from the Special Tribunal for the Water Conservation Order will influence Council's further consideration of nitrate management in the contributing catchments.

[132] Refer Aqualinc 2017

16.4.5 Summary of protections for Te Waikoropupū

There are a number of management controls and protections for Te Waikoropupū that FLAG have identified in the recommendations package. These are listed below to provide a complete picture of the package of provisions applicable to Te Waikoropupū (refer respective report sections for details).

Values of water

- Identification of values of water in the Tākaka FMU (including for Te Waikoropupū) and associated attributes and states for freshwater objectives
- Identification of Te Waikoropupū as an Outstanding Freshwater Body under the NPS-FM and identification of outstanding values for: wāhi tapu (sacred place), strong artesian flow and water clarity, plus associated attributes and freshwater objectives.

Protection of spring flow

- Mapping of new Arthur Marble Aquifer management zones (AMA Recharge and Lower AMA Zones). These are separate from, and overlapping with the other surface and groundwater zones in the FMU
- Associated Arthur Marble Aquifer zone accounting that reflects current understanding of the influence of different contributing catchments on aquifer recharge and Te Waikoropupū flows – including several factors of conservativeness (a precautionary approach) about the flow contributions to Te Waikoropupū (refer section 16.4.2)
- Identification of a minimum flow at Te Waikoropupū main basin – which also protects flows at Dancing Sands and Fish Creek Springs
- Protection of the minimum flow through four cease take provisions in contributing waterbodies, and at the Waikoropupū main spring, including a pressure based cease take in the confined AMA
- Identification of restart triggers for resumption of abstraction following cease take to ensure water flows have sufficiently resumed in each part of the system before abstraction can restart
- Identification of a range of allocation limit options for the area that recharges the AMA and influences flow at Waikoropupū. Options range between existing use and an ecologically sustainable upper limit as recommended by Cawthron (2017). The Cawthron recommendation is conservative as the allocation limit is based only on flows through Te Waikoropupū springs and not on the total aquifer flows (refer section 16.6.5)
- A new Waikoropupū Exclusion Zone to avoid any new bores or new water takes from the AMA within one kilometre of the main spring (refer Section 10.9.3)
- New bore information requirements for new bores (land use) within the AMA[133]

Protection of water quality in contributing catchments and the AMA

- Improved protection of karst sinkholes (refer section 11.2.3.1)
- Responsive land use controls in the AMA Recharge Zone linked to water quality monitoring at Waikoropupū main spring (refer section 11.3.6), including requirement for:
    - Good management practice
    - Risk to water planning
    - Waterway setbacks for specified activities
    - Stock exclusion

[133] Council staff can advise on these requirements.

    - Information provision to Council (or industry bodies for Council-approved programmes)
- Policy supporting the protection and restoration of riparian vegetation, including for water quality benefits (including surface water bodies in the recharge area)
- Support of restoration of surface water bodies that flow into Te Waikoropupū Springs Reserve
- Land use rules to control intensification in the recharge area (refer section 0).

Non-regulatory methods (refer Section 13)

- **Monitoring and Investigations:**
    - New baseline monitoring of clarity and dissolved oxygen at the main spring
    - New monitoring in the Tākaka River at Lindsay's Bridge (as an indicator of water quality entering the aquifers)
    - Proposed investigation and audit programme for onsite wastewater systems, including the AMA Recharge Zone
- **Education and Advocacy:**
    - Liaison (including staff resourcing) with local industry and industry groups to promote and advocate good management practice for the protection of water quality and efficient water use
    - Promotion and advocacy (including staff resourcing) for riparian and aquatic habitat restoration, including water bodies in the contributing catchments
- **Financial incentives and assistance:**
    - Continued Council funding of fencing materials for stock exclusion and improvements to water health (including riparian and aquatic restoration)
    - Partnering with existing restoration and enhancement networks to maximise opportunities for shared funding and leveraging effort for quality improvement (eg economies of scale, mosaic funding, etc)

Plus a further region wide plan change (refer Section 12) covering a number of issues more appropriately addressed at a regional level. These will have further influence on water quantity and quality management in the Tākaka FMU and Arthur Marble Aquifer management zones.

16.5 Potential elements of a Tākaka Freshwater Plan Change:

This section lists potential elements of a Tākaka Freshwater Plan Change. Council staff can provide further information on the specific changes that would be required to the TRMP through this approach.

1. **Values of Water**
   Aim: to define community and iwi/hapu values of water and associated attributes and freshwater objectives to ensure these values are provided for
   Plan elements:
    a. Addition of relevant policy to reflect requirements under the NPS-FM and new approaches to water management
    b. Identification and inclusion of community and iwi/hapu values of water identified for the Tākaka FMU
    c. Identification and inclusion of water attributes and cultural tohu and accompanying freshwater objectives to support the uses and values

2. **Allocation Framework - Water Quantity Management**

Aim: to protect low flow, water levels and flow variability to protect waterbody health, and enable allocation of water for use to provide for individual and community economic and social wellbeing

Plan elements:

a. Addition of relevant policy to reflect requirements under the NPS-FM and Tākaka specific elements for water management including:
    i. Protection of minimum flow using rationing and cease take triggers
    ii. Protection of tributaries in water management zones
    iii. Protection of Waikoropupū and adaption of management as needed
b. New FMU and water management zones shown on the planning maps
c. Inclusion in the TRMP of new allocation regimes, including minimum flows and levels, allocation limits, rationing and cease take triggers and restart triggers for all management zones in the Tākaka FMU
    i. consideration of prohibited activity status for takes above allocation limits
d. Specific protections for Te Waikoropupū including:
    i. An exclusion zone within 1km of Waikoropupū main spring to avoid any new bores or water takes from the Arthur Marble Aquifer
    ii. Setting of a minimum flow at the main spring and an allocation limit for the area of contributing catchments that influence flows at Te Waikoropupū
    iii. Setting of cease takes to protect the minimum flow at the main spring and pressure within the confined Arthur Marble Aquifer to protect the artesian flow.
e. Identification of water to be reserved for:
    i. potential future community water supply
    ii. meeting water needs in respect of Treaty of Waitangi settlement lands[134]
f. Amendments to bore information requirements for improved management of groundwater effects, particularly for takes from the Arthur Marble Aquifer

3. Water Quality Framework - management of Risks to Water quality

Aim: to ensure everyone is operating at least at 'good practice' and risks from land use are well managed.

Plan elements:

a. Addition of relevant policy to reflect requirements under the NPS-FM and Tākaka specific elements for water quality management including:
    i. Control of land use and land use practice to manage diffuse discharges
    ii. Responsive management to meet freshwater objectives, particularly with regard to protection of Te Waikoropupū
    iii. Highlighting the importance and need for protection of riparian vegetation and aquatic habitat in maintaining and enhancing water quality and Ecosystem Health
b. Amendment to rules to better protect karst sinkholes
c. Minimum standards to be met by all land uses
    i. Waterbody setbacks for specific activities and new infrastructure
    ii. Maximum levels of land use intensification to manage increases in risk to water
    iii. Stock exclusion from waterbodies

[134] Refer TRMP policy 30.2.3.27

iv. Requirements for specific land use practices to use industry good practice methods

d. Identification of land use activities that pose a moderate or high risk to water – including point discharge and diffuse discharge across key contaminants of sediment, microbial pathogens, nitrate and phosphorus
e. Requirement for Risk to Water planning within day-to-day business operations - including Farm Environment Planning, through creation of new regional land use rules for land use activities with high or moderate risk to water, including requirement for:
    i. Property registration with Council
    ii. Risk to Water planning, including risk assessment, action plans and auditing.

4. Protection of Te Waikoropupū

Aim: to recognise the importance of Te Waikoropupū and protect its outstanding values

Plan elements:

a. Recognition of Te Waikoropupū as an Outstanding Freshwater Body under the NPS-FM and identification of the outstanding values of Te Waikoropupū requiring protection
b. New planning map zones defining the catchment areas subject to policy and rules to protect the outstanding values of the springs
c. Creation of new regional land use rules to enable responsive and adaptive management in areas that recharge the Arthur Marble Aquifer and Te Waikoropupū Springs, including requirement for more prescriptive Risk to Water planning if monitored trends at the main spring reach trigger levels
d. Creation of new regional land use rules in surface catchment areas that flow into Te Waikoropupū Springs, including requirement for riparian restoration and setbacks from the reserve boundary for specific activities
e. New exclusion rules to avoid new bores and new takes from the Arthur Marble Aquifer within 1km of Te Waikoropupū.

5. Waterbody Habitat and Ecosystem Health Management

Aim: to recognise the importance of riparian vegetation in maintaining and enhancing water quality, and aquatic and riparian habitat in providing for Ecosystem Health.

Plan elements:

a. Addition of relevant policy highlighting the importance and need for protection of riparian vegetation and aquatic habitat in maintaining and enhancing water quality and Ecosystem Health
b. Creation of new regional land use rules that require Waterbody Restoration Planning by 2050 (supported by non-regulatory methods prior to 2050), or sooner in priority catchments (eg Fish Creek).

16.6 Allocation framework - further information

This section sets out supplementary information on the allocation framework including:

- the key flow statistics, 7-day MALF and 5-year Low Flow
- how cease take triggers are calculated
- options where FLAG did not reach consensus (Anatoki and the Arthur Marble Aquifer Recharge Zones) and the reason for each option put forward
- the accounting used for the Arthur Marble Aquifer Recharge Zone.

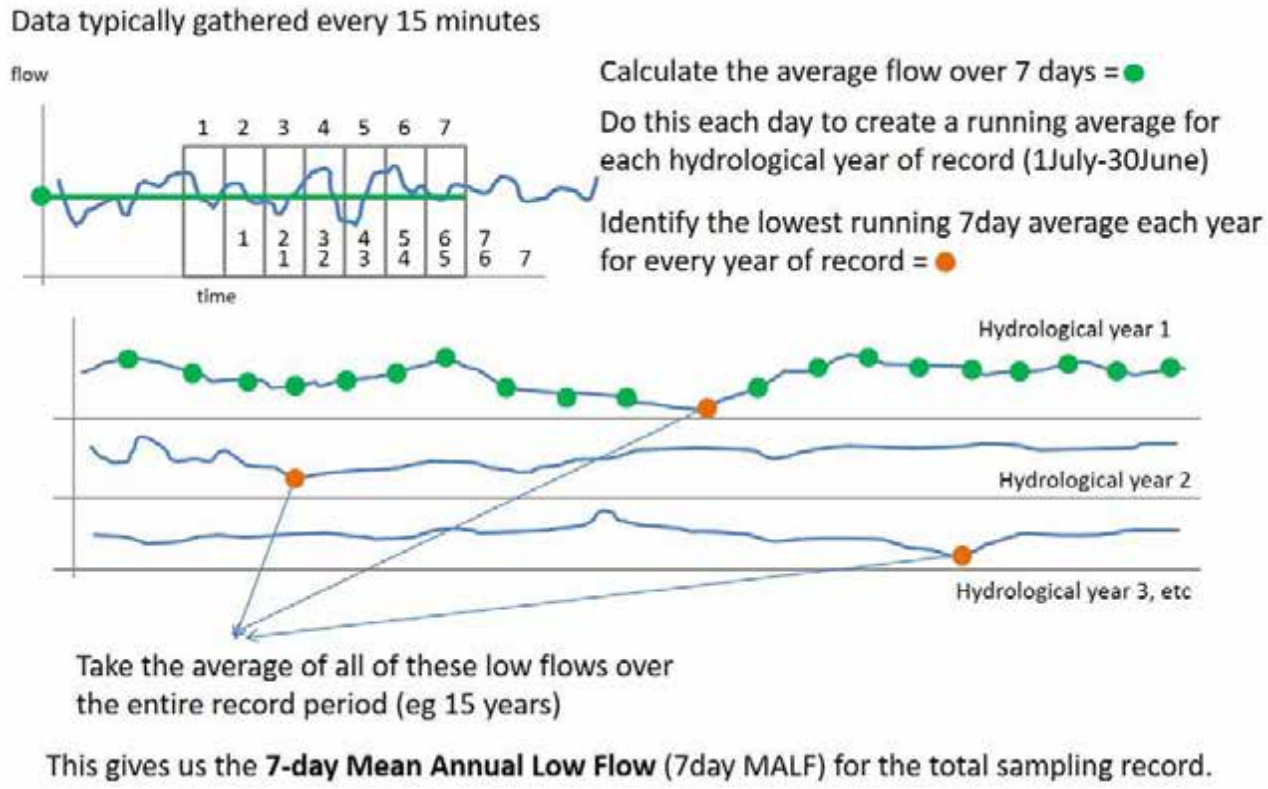
16.6.1 What is a 7 day MALF?

The 7-day MALF is based on the total historic flow record held for each river, and is the average of the lowest running 7-day average flows in each hydrological year of the historic record (refer Figure 14). The longer the historic record, the more robust the calculation of the 7-day MALF. All references to MALF in the text are in reference to the 7-day MALF unless otherwise stated.

The 7-day MALF was used in preference to the 1-day MALF for four reasons:

1. The 7-Day statistics have consistently been used as the critical low flow statistic in Council plans for rivers elsewhere in the region e.g. TRMP Water - Chapter 30, Policies 30.1.3.13 and 30.1.3.15
2. The proposed National Environmental Standard on Ecological Flows (2008) specified a 7-day MALF
3. 7-Day MALF smooths out short-term flow variability
4. There are advantages for assessing water usage compliance as Council typically uses weekly usage to assess compliance with allocation.

Figure 14 Determination of the 7-day MALF



Because MALF is an average, yearly low flows occur both higher and lower than the MALF. For example below are plots of all the annual low flows for the Waingaro River and Te Waikoropupū Springs – with their MALF shown as an orange line. For comparison, in the Waingaro Zone cease take is set at 3.143 m^3/sec (show as a green line), and in the Waikoropupū main spring the cease take is set at 7.661 m^3/sec – the same as it's MALF (the orange line). As can be seen, in both cases the waterbodies will naturally go lower than both their MALF and the cease take triggers.

Figure 15 Annual Low Flows and Mean Annual Low Flow (MALF) for Waingaro River

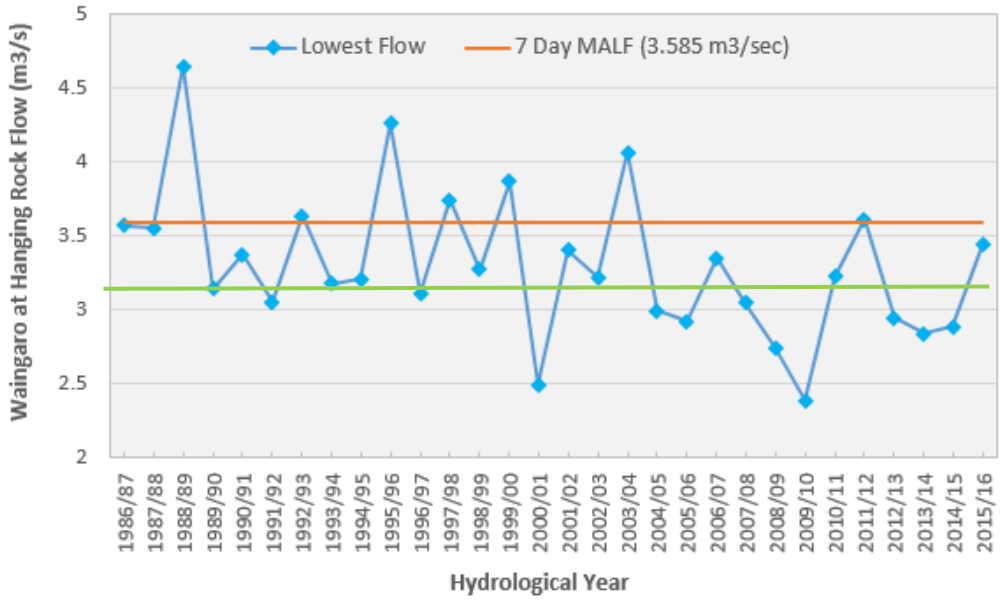
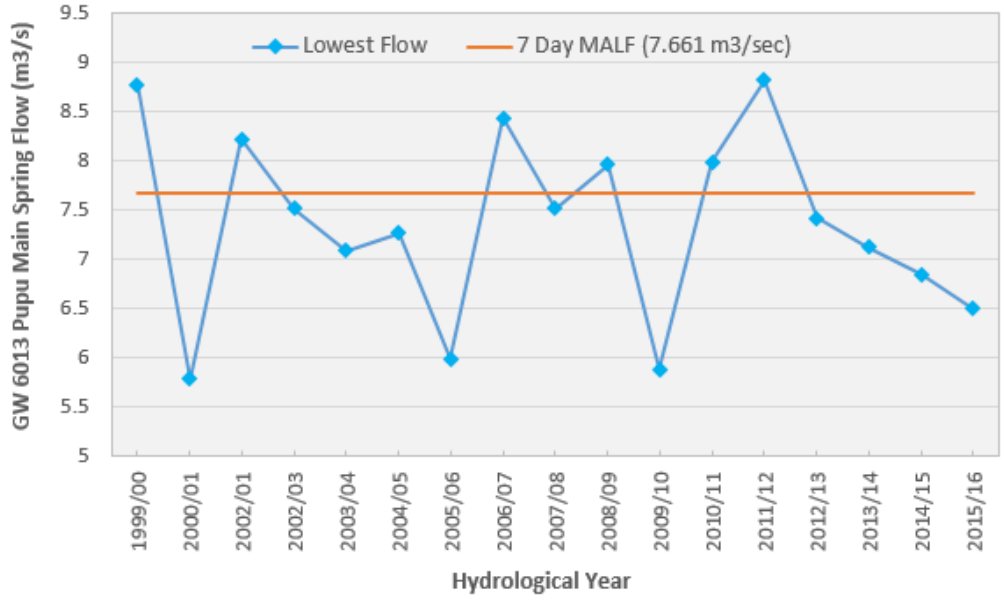


Figure 16 Annual Low Flows and Mean Annual Low Flow (MALF) for Waikoropupū Main Spring

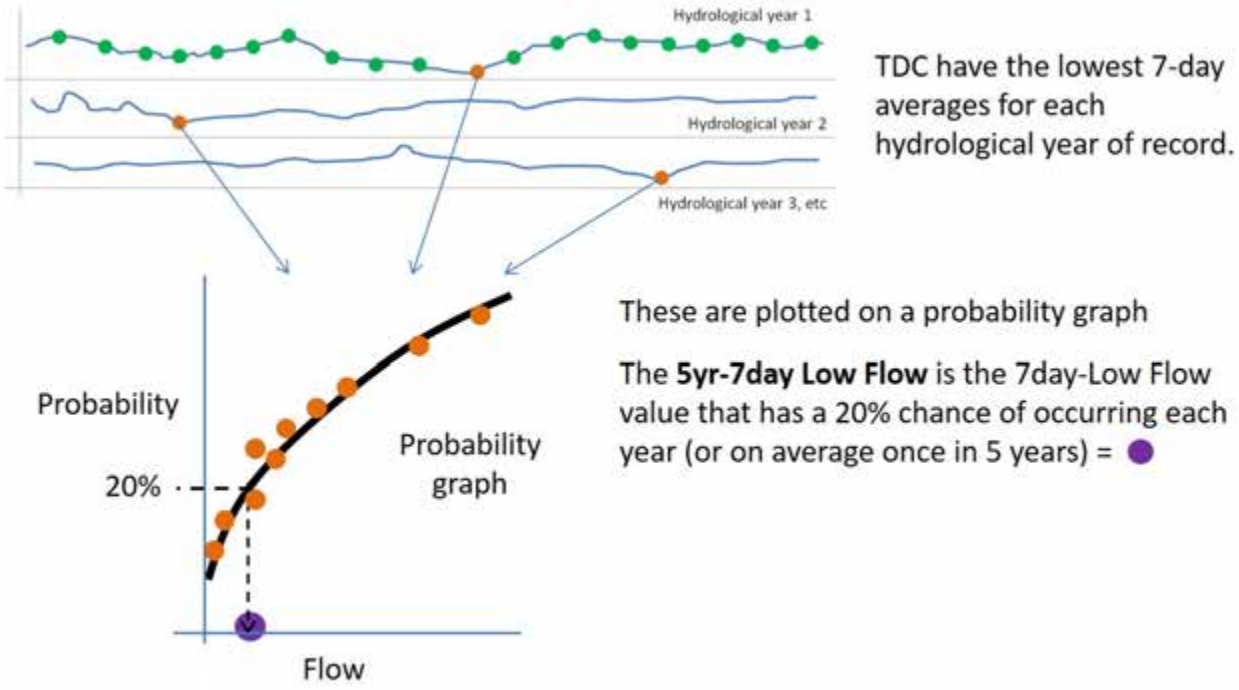


16.6.2 What is the 5-year 7-day Low Flow?

The 5-year 7-day Low Flow is the 7-day low flow that has a 20% chance of occurring each year (ie once on average in 5 years). It is calculated by plotting the lowest flow in each hydrological year on a probability graph (refer Figure 17).

The default allocation regimes in the TRMP use the 5-year 7-day Low Flow, with allocations set at either 10% of this flow, or up to 33% depending on the significance of the waterbody (refer TRMP policies 30.1.3.15 and 30.1.3.16). The 5-year 7-day Low Flow is a more conservative measure than the 7-day Mean Annual Low Flow (7-day MALF).

Figure 17 Determination of the 5-year Low Flow



16.6.3 Cease take trigger calculation

The flow-based cease take triggers that are applied in each zone depends on the location of the flow recording site in relation to the water takes, and the nature of the river flows (refer Figure 18).

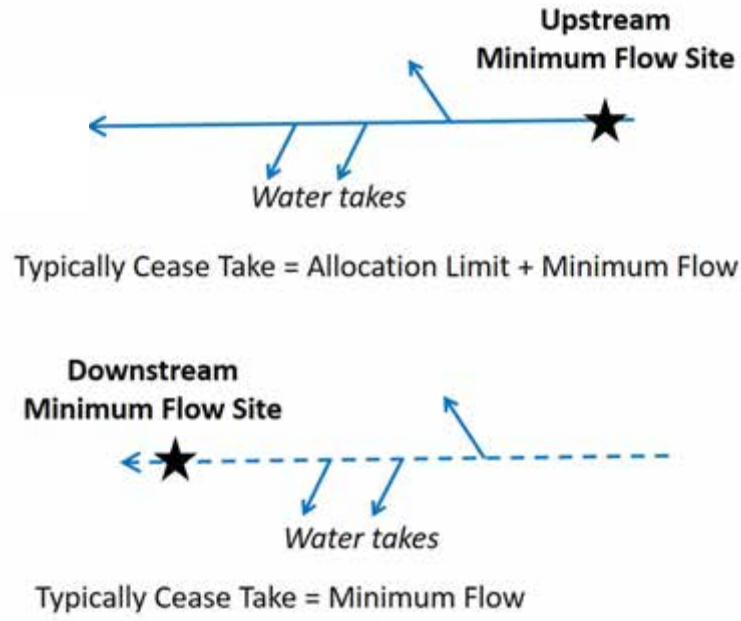
For the majority of the zones the flow-monitoring site is located above the takes and the cease take trigger is calculated by adding the minimum flow and the allocation limit. If the monitoring sites are below the takes, the cease take is just based on the minimum flow. There are two exceptions to this, the Arthur Marble Aquifer Recharge zone and the Motupupi zone:

Arthur Marble Aquifer Recharge Zone - while the monitoring site for the Arthur Marble Aquifer Recharge Zone is at Te Waikoropupū main spring (for the springs flow based cease take), which is 'below' the takes in the recharge zone, it is technically impossible to naturalise the flow record at the Te Waikoropupū springs site since abstractions in the contributing catchments have a complex relationship, and because of the influence of the Cobb Dam releases on flows (refer 16.4.2). Further, there is a substantial amount of water that leaves the Arthur Marble Aquifer, which is thought to flow out to sea. For these reasons, the method of minimum flow plus allocation limit has been used to determine the cease take trigger as added conservativeness to the regime.

Motupipi Zone – the Motupipi is a gaining river (ie part of the river flow comes from groundwater springs) at the location of the flow monitoring site, so the cease take trigger is based only on the minimum flow.

For practical implementation purposes, the cease take trigger levels in some zones are correlated to another site that has a telemetered monitoring site. For example, this is the case for the western coastal catchments where the local river cease take flows have been correlated to flows at the Anatoki River site at Happy Sam's to enable consent holders to use the online data available for Happy Sam's to determine their take status (refer Section 10.7.4 for further explanation).

Figure 18 Schematic of flow recorder location relative to water takes in determining Cease Take calculation methodology



16.6.4 Anatoki Zone allocation regime options

This section provides the additional information needed for Council to consider FLAG's reasons with respect to FLAG Recommendation 14 in Section 10.9.2. The Anatoki Zone is intended to protect the Anatoki River and its tributaries.

Key features of the Anatoki River:

- Anatoki is a big river with a similar ecological ranking (Cawthron, Jan 2017) to Waingaro, but it smaller than the Waingaro River
- There is no waiting list for water and limited further demand - but there may be future demand from plausible irrigable areas of the catchment
- It is a gaining river at the gorge, losses occur to the Tākaka Gravel Aquifer in the lower reaches
- River flows make no contribution to the Arthur Marble Aquifer in the lower areas because of the overlying geology, and river flows do not influence flows at Te Waikoropupū (GNS, 2001)
- A relatively high mean flow at 12,000 l/s
- MALF at Happy Sams is 2156 l/s, MALF at One Spec Road is 1707 l/s (losing reach)
- 79 l/s of current takes - 3 surface takes, 1 groundwater take – all in lower area
- The salmon farm is a non-consumptive take so is not included in the allocation calculations

- Ranked by Cawthron as having Moderate-High ecological values
- Anatoki is more 'U' shaped than Waingaro River so water takes are likely to reduce habitat by a lesser extent.

16.6.4.1 Anatoki Zone options considered by FLAG

The Cawthron recommended regime range[135] for the Anatoki Zone – based on Anatoki being ranked as having moderate-high ecological value is:

- Minimum flow between 70-90% of MALF
- Allocation limit between 20-30% of MALF

The single recommended regime was 80:20 – a minimum flow at 80% of MALF and allocation limit at 20% of MALF (with minimum flow protected by both rationing and cease take triggers at 100% and 90% of MALF respectively).

During FLAG discussions, it was noted that there was lower demand for water in the Anatoki Zone compared to the similarly ecologically ranked Waingaro Zone (ie there is no waiting list in the Anatoki Zone). Some members raised that given the lower demand, should a greater level of protection be provided in order to "*leave this one as it is"?*

Members considered the need for water in the Anatoki Zone, including reviewing the 'plausible irrigation map', which identifies potentially irrigable land in the zone, which indicated that likely future demand (for irrigation) was lower than the proposed allocation limits.

Subsequently, a further alternative regime of 90:10 (minimum flow at 90% of MALF and allocation limit at 10% of MALF – rationing and cease take triggers would be at 100% and 95% of MALF respectively) was identified by FLAG members as having greater environmental protection (lower risk) and still providing an adequate allocation limit for current and future water use.

However, no consensus was reached between a 90:10 and 80:20 regime, largely due to the desire to provide greater ecological protection and keep flows in the river, versus consistent application of the Cawthron methodology across the FMU and providing an acceptable security of supply.

A further option of 80:10 was suggested by staff late in the process, in light of the impact the Anatoki Zone decision has on water availability in the Tākaka Township Zone[136]. This is because the allocation limit set in the Tākaka Township Zone must account for allocation limits in both the Waingaro and Anatoki zones. With an allocation set in the Anatoki of 20% of MALF (under a 80:20 regime), this reduces the allocation limit in the Tākaka Township zone. Consequently, there is 75 l/s of water available in the Tākaka Township zone, which is intended to be reserved for potential future community water supply (the estimated need was 80 l/s), but no additional water for any other uses such as commercial or industrial use in the Tākaka township.

A 10% allocation limit in the Anatoki enables water to be available in the Tākaka Township zone, which would help support the community's future economic well-being, in providing for new industrial or commercial uses in the Tākaka Township – where there is relatively easy access to

[135] Refer Cawthron Jan-2017

[136] This matter was picked up when staff were doing a final check on the water accounting for the FMU, and arose because earlier review of the Tākaka Township limits used only the 90:10 Anatoki allocation regime, which was subsequently corrected to a non-consensus position including the 80:20 regime.

good quality water, near the main population base in Golden Bay/Mohua. Because of this the 80:20 regime was replaced with the 80:10 in the options supported by the FLAG members.

The number of FLAG members and MKM support for each option is listed in Table 14 and the options are summarised in Table 15. FLAG members were able to support both options if desired.

Table 14 Summary of FLAG and MKM support for Anatoki Options

Zone	**Option**	FLAG numbers in support
Anatoki Zone	**Option 1 – 90:10 regime** Minimum flow 90% of MALF, Allocation limit 10% of MALF (Rationing at 2111 l/s, cease take at 2026 l/s)	7 of 12 & MKM support
	Option 2 – 80:10 regime Minimum flow of 80% of MALF, Allocation limit of 10% of MALF (Rationing at 1896 l/s, cease take at 1810 l/s)	6 of 12

Table 15 Comparison of Anatoki Zone options and effects on Tākaka Township Zone

Anatoki regime option	Anatoki minimum flows (l/s) (at Happy Sams)	Anatoki allocation limit (l/s)	Resulting Tākaka Township allocation (l/s)[137]	Tākaka Township allocation limit less existing use (- 136.8 l/s)	Reservation for community supply (Tākaka Township - wanted 80 l/s)	Additional water for other uses in Tākaka Township	Anatoki Security of supply (rank)
90:10	1940	171	383	246.2	80	166.2	2nd (rationing at 2111 l/s, cease take at 2026 l/s)
80:10	1725	171	383	246.2	80	166.2	1st (rationing at 1896 l/s, cease take at 1810 l/s)

The key difference between the two options is the minimum flow that is protected (higher in the 90:10 than 80:10), and the resulting security of supply for water use (higher security in the 80:10 than 90:10). The FLAG member reasons for support of each of these options are listed below.

Option 1 - 90:10 Allocation Regime

FLAG member reasons for supporting the 90:10 option are:

- Nature of river:
  - Size of river – has a tendency to flat-line at low flow.
  - Has a lower, shallower flow spread over wide bed, making the water warmer and consequently prone to algae blooms
- Values of river:
  - It has high social /recreational values with important swimming values: eg One Spec and Emerald Pools. Want clear water here – would like to see my toes
  - Valuable to tourism economy
  - There is a blue duck (Whio) population in the lower gorge
  - Tuna and trout
- The first right of water is to water (Te Mana o Te Wai)

[137] Tākaka Township allocation limit (10% of MALF = 1104 l/s), less Waingaro allocation limit (550 l/s) and less Anatoki allocation limit (as per option)

- Lower demand for water:
    - Low potential for use of allocated water
    - Because we can – demand is not present, so not disadvantaging anyone by not allocating the water.
- The 10% allocation limit would provide the same allocation as Option 2, which is considered sufficient for existing and the estimated future irrigation needs in the Anatoki Zone, and enables water to be available in the Tākaka Township Zone

Option 2 - 80:10 Allocation Regime

FLAG member reasons for supporting the 80:10 option are:

- An 80:10 would protect the same minimum flow as recommended by Cawthron, but would be more ecologically conservative than the previously recommended 80:20 regime, due to the lower allocation limit - meaning that the minimum flow would be reached less often.
- Prefer to trust Cawthron's advice regarding minimum flow:
    - Relies on the recommendation of independent expert (Dr Roger Young)
    - Consistent application of the allocation regime methodology for the FMU
    - Similarity to Waingaro (eg ecological ranking) – need to ensure approach applied there consistent with approach applied for Anatoki
- The 10% allocation limit would provide the same allocation as Option 1, which is considered sufficient for existing and the estimated future irrigation needs in the Anatoki Zone, and enables water to be available in the Tākaka Township Zone
- This flow does not affect Te Waikoropupū, so provides for economic opportunity away from the Arthur Marble Aquifer recharge area
- As a result of the lower rationing and cease take triggers, this option would provide better security of supply for users than Option 1.

16.6.5 Arthur Marble Aquifer Recharge Zone - allocation regime options

This section provides the additional information needed for Council to consider FLAG's reasons with respect to FLAG Recommendation 14 in Section 10.9.2.

The Arthur Marble Aquifer Recharge Zone is intended to provide protection to Te Waikoropupū Springs, by setting both a minimum flow at the springs, to be protected by cease takes, and an allocation limit for all areas that influence flow at the springs, namely the Tākaka and the Waingaro Rivers and their tributaries south of the confined-unconfined boundary of the Arthur Marble Aquifer (approximately south of Hamama - refer section 16.4.2 for discussion on contributing catchments).

This zone overlaps the contributing catchment zone regimes, so the water takes in the contributing catchments will need to comply with the allocation limits in both their catchment regime and the Arthur Marble Aquifer Recharge Zone.

16.6.5.1 Arthur Marble Aquifer Recharge Zone - Options considered by FLAG

The Cawthron recommended regime range[138] for the Arthur Marble Aquifer Recharge Zone – based on Te Waikoropupū being ranked as having high ecological value is:

- Minimum flow between 70-90% of MALF
- Allocation limit between 20-30% of MALF

[138] Refer Cawthron Jan-2017

The single recommended regime was 90:10 – a minimum flow at 90% of MALF and allocation limit at 10% of MALF. This is more reflective of a significant ecological ranking and reflects an element of conservativeness for the springs. The minimum flow at the springs is to be protected by four cease take triggers at:

- Upper Tākaka Mainstem Zone cease take based on flows in the Tākaka River
- Waingaro Zone based on flows in the Waingaro River
- confined Arthur Marble Aquifer (Lower Arthur Marble Aquifer Zone), based on pressure in the aquifer
- Tākaka Remainder Zone based on flows at Te Waikoropupū main spring

(refer Figure 5 in section 5.2)

The cease take based at the springs has been set to 100% of MALF (rather than at minimum flow) for added conservativeness[139]. The Upper Tākaka Mainstem and Waingaro cease takes are likely to be triggered ahead of the springs-based cease take (based on triggers to protect their respective rivers), so overall the flow protection will be higher than 90% of MALF.

The pressure based cease take in the confined part of the aquifer is unlikely to be triggered as the aquifer has always had positive pressure, but this is included as backstop protection for any future takes from the confined part of the aquifer.

FLAG has undertaken considerable discussion, multiple times, to seek a consensus position on the management of the Arthur Marble Aquifer Recharge Zone and Te Waikoropupū Springs from both a flow and quality perspective. Whilst all of FLAG agree on wanting to be precautious in protecting all of the values associated with the flow and quality of water at Te Waikoropupū Springs, and their contribution to the essence and mauri of Te Waikoropupū, no consensus has been reached on the allocation regime.

Across the individual members of FLAG there is support for three different options:

- Option 1: More water: 766 l/s or 10% of MALF as recommended by Cawthron
- Option 2; No more water: 408 l/s (existing consented amount - equivalent to 5.3% of MALF)
- Option 3: More water: four phased release up to 766 l/s - based on water quality monitoring at the main spring

(See Table 16)

The difference between the options is the allocation limit. All options have the same minimum flow set at 90% of MALF. This would be protected by the four cease takes, as outlined above. The specific trigger levels for the flow-based cease takes will depend on the decisions made regarding the allocation limits in the recharge area and contributing catchments.

All three options are presented to Council to reflect the spectrum of views held by FLAG. FLAG members who support Option 2, along with others in the Golden Bay/Mohua community[140], want assurances from the Council that the water quality management framework proposed will be implemented and enforced – if that occurs those FLAG members are supportive of the staged release of the allocation limit in Option 3.

[139] Typically where monitoring sites are below the takes, cease take is set at the minimum flow, however for added conservativeness the cease take at Te Waikoropupū springs has used 100% of MALF rather than 90% of MALF – refer Section 16.6.3.

[140] As noted in feedback to FLAG and at public meetings during community consultation

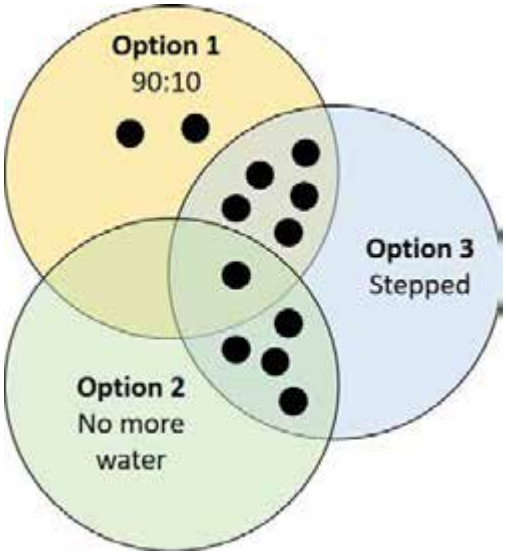
The numbers of FLAG member and MKM support for each option is listed in Table 16 and the FLAG member reasons for each position are outlined below. Note that members did not have to choose between the options, they instead chose which options they support and would be comfortable with.

Table 16 Summary of FLAG and MKM support for Arthur Marble Recharge Zone Options

Zone	Option	FLAG numbers in support
Arthur Marble Aquifer Recharge Allocation	**Option 1 – 90:10 regime** - with allocation limit of 766 l/s (Cawthron recommendation for zone)	8 of 12
	Option 2- No more water: 90:5.3 regime - with allocation limit of 408 l/s[141]	5 of 12 & MKM support
	Option 3 – Stepped Allocation: 90:5.3 to 90:10 regime - with: Step 1: no more water (408 l/s) Step 2: 550 l/s Step 3: 650 l/s Step 4: 766 l/s (with steps dependent on acceptable water quality at the main spring)	10 of 12 & MKM support

The range of selections is shown in Figure 19.

Figure 19 Diagram of FLAG member selection for Arthur Marble Aquifer Recharge zone options



The rationale for supporting each of the options are outlined below. Note that the reasons listed below reflect the spectrum of views across FLAG members and each point is not necessarily reflective of what the whole of FLAG thinks.

[141] Allocation limit based on existing consented amount in the Arthur Marble Aquifer Recharge Zone using zone accounting method outlined in Section 16.6.6

Option 1 – 90:10 Allocation Regime (Cawthron Recommended)
Water allocated as per science expert recommendation.

FLAG members supporting this option consider that using the expert advice is precautionary in nature, and the allocation limit is ecologically sustainable. It will have no measurable effect on water flows at the springs, plus provides for economic opportunity in the recharge zone. This proposed approach introduces greater protection to Te Waikoropupū and water flows than is in place now. Members who supported this approach seek to manage risks to water quality from possible intensification through land use and discharge controls, rather than attempting this through limiting the allocation of water, particularly as any land use effects on water quality need to be managed for both irrigated and non-irrigated land alike.

FLAG member reasons for supporting this allocation regime include:

- **Making water available creates economic and social benefits:**
  - There is plenty of water in the system
  - Option 1 provides an opportunity for a potential range of end uses with benefits (eg money flows) in the catchment and regionally
  - Whilst the existing waiting list for water suggests that the applications will mostly be for water takes for use in dairy farming, the water may not be taken up by dairy or even livestock, if water and land use changes over time – if we don't allocate any more water we also take away opportunity from the Tākaka community to use the water for something other than dairying
- **Conservativeness of approach** - the proposed regime as a whole provides greater protection than currently:
  - The experts have sought to make recommendations that are conservative to minimise risk
  - Option 1 meets the environmental values – it is the ecologically sustainable limit of water that can be extracted
  - The flow management regime includes cease takes, which offer the highest level of protection for minimum flows
  - Te Waikoropupū is protected by overlaying levels of conservatism, including the other catchment controls
- **Anticipated outcomes:**
  - Option 1 won't change water quality or flow levels significantly – the nitrate modelling work[142] identified potential for only a small increase in nitrate (0.05mg/l) and we don't think we will be able to detect a difference to the ecological values at Te Waikoropupū based on advice from the Science Panel[143]. The proposed minimum flow, allocation limit and cease takes operate together to better protect spring flows than currently
  - Setting the allocation limit does not mean all the water within that allocation limit is going to be immediately taken and used – it could take a good 5-10 years; rather it allows the upper limit to any future take and use to be established.

[142] Aqualinc December 2017
[143] Cawthron Report 2949 March 2017

Option 2 – 90:5.3 Allocation Regime - No additional water
No more water allocated.

During FLAG discussions, some members were uncomfortable about allocating further water in the recharge zone, when this was likely to be used for additional dairy irrigation. This was considered to be increasing the risk to water quality at Te Waikoropupū, and therefore not acceptable given uncertainty around the effects of land use and the potential lag time in observing effects at the springs. As such, some FLAG members believe that taking a precautionary approach in this instance means setting the allocation limit at the current consented amount. Based on the recharge zone accounting (refer Section 16.6.6) this is 408 l/s[144] (equivalent to a 90:5.3 allocation regime).

FLAG member reasons for supporting this allocation regime include:

- **Importance of Te Waikoropupū:**
  - Te Waikoropupū is sacred to iwi and the public
  - Because of this sacredness we should put a halt on any further allocation (irrespective of whether it can be detected at the springs) – there is still opportunity for water take from the Tākaka Gravel Aquifer.
  - This supports MKM's view of the need for a moratorium on more takes , which is consistent with the Water Conservation Order application[145]
- **Concern over effectiveness of water quality management**
  - Concern that the package of provisions to manage water quality[146] will not adequately avoid irrigation driven attributions for nitrate (noting that irrigation per se may not increase nitrate losses, but does allow more stock, which would increase nitrate losses).
  - Some do not trust the Council to implement the water quality provisions package
  - This places precautionary control on potentially polluting land uses (ie dairy irrigation)
  - We need incentives to provide for more sustainable water uses from within the existing allocation limit
  - Wanting proof that nitrogen can be reduced through mitigation, before having faith that mitigation will improve water quality
  - Need to achieve a sustained reduction in nitrate in the springs before further water is allocated
- **Anticipated outcomes**
  - Stays with the status quo – it is precautionary
  - Provides a clear line in the sand – no more death by a thousand cuts
  - Living within our means – existing use can be made more efficient – creates necessity for users to be more efficient with water, rather than taking more
  - Water could be reserved for future opportunities/technologies - if there are more sustainable water uses than current uses, then release of reserved water can be reassessed[147].

[144] This number is as of June 2019, and has changed over the course of the FLAG process due to modifications to the accounting method – largely the removal of the lower Waingaro from the earlier accounting - and changes to individual consents in the recharge area.
[145] At a hui on 17 December 2018, MKM identified they also supported the Stepped approach (Option 3)
[146] Which include the combination of the minimum requirements for high risk activities (eg setbacks and stock exclusion), on farm risk to water planning and management, management in the AMA recharge that correlates with water quality, improvements to discharge rules, and restrictions on changes to land use to activities or intensity levels that increase risk to water.
[147] Consideration of take and use management based on end uses of water is not part of the recommended management regime, but is included in Section 15 covering matters warranting further consideration by Council.

FLAG members who support Option 2 are also supportive of the staged release of the allocation limit – Option 3, provided that the Council implements and enforces the water quality management framework proposed.

Option 3 – 90:5.3 to 90:10 Stepped Allocation Regime
A four step staged approach to water allocation up to the science expert recommendation.

Staff explained to us that using water allocation was not the appropriate planning tool for managing water quality. Staff opinion is that water quality is best managed either through management of the land use practices and activities that generate the adverse effects on water quality, or through the management of the use of water[148], where this may be generating risk to water. However, many FLAG members still wanted there to be no more water allocated in this catchment because of the reasons outlined above under option 2.

During discussions on these issues a third option arose: a stepped approach to allocation.

The 'stepped approach' would begin at 'no additional water' (5.3% of MALF, 408 l/s) and progress in steps – for example every three years[149] - up to the Cawthron recommended allocation of 10% of MALF (766 l/s), with the decision to release further allocation based on water quality at Te Waikoropupū remaining within acceptable ranges[150].

The 'stepped approach' is seen to allow assessment of the effectiveness of land use management in avoiding risks to water quality, before more water is released for potential take and use[151]. This brings in the ethos that those who use water, have a responsibility through that use and other land use practices to care for the water. If the water is inadequately cared for (and water quality degrades to certain trigger levels), then no further water is made available for anyone to take and use.

This approach was also offered as a potential socially acceptable approach, where (irrespective of whether allocation and water quality could be linked in any causal way) the approach allows time for water users to demonstrate their social and environmental responsibility to the community - to demonstrate their duty of care for the resource they use.

Additionally this approach allows more time for the outcomes of the Water Conservation Order process to be known. From the date of notification of the Tākaka Freshwater Plan Change (which is anticipated to be after the Special Tribunal recommendations on the WCO), there will be a further three years for any relevant details from the WCO to be determined and applied, before any water is released.

This is a policy approach that takes both the science and the measurable, and combines it with the less tangible, but no less important social, cultural and spiritual considerations.

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[148] The use of allocated water, is currently managed in the TRMP through the take and use provisions associated with the controlled consent plan requirements and conditions.
[149] A period of three years was suggested as it is longer than the average age of water thought to come from the valley floor (average 1.2 years - refer Stewart and Thomas 2008) and provides for three years of water quality data assessment which should provide a minimum level of data points for analysis.
[150] These ranges are still to be determined and are likely to be influenced by recommendations regarding the Water Conservation Order.
[151] Acknowledging that the land use management applies to non-irrigated land also, and that any take and use of water within an allocation limit requires consents that meet management conditions.

FLAG member reasons for supporting this allocation regime include:

- **Precautionary approach due to uncertainty in managing water quality**
    - There is no technology to monitor nitrogen that can apportion it to source and there is no technology for cleaning up nitrogen in water if levels increase
    - There is a lack of information and certainty around the attribution of nitrate (the cause-effect link). We know what might go in and what comes out, but not the black box in the middle, so this builds in time to access the water quality results before allocating more water
    - There is the possibility of irreversibility of effects on the aquifer – this approach accommodates risk, time lags of impacts, uncertainties in the ecological system, and the effectiveness of new plan provisions and existing ones (such as the water take and use provisions).
    - This option provides time for better land use practices to be put in place, and monitoring to take place to assess efficacy of plan provisions that is faster than the plan revision process
- **Concern over effectiveness of water quality management**
    - Adaptive management is not possible in this catchment because of the estimated 8 year average time lag from water going into the system and resurfacing at Te Waikoropupū main spring, so we should achieve good water quality before allocating more water
    - Option 3 gives greater insurance against water quality risks, by tying the release of the allocation limit to monitoring outcomes at Te Waikoropupū.
- **Provides for economic and social benefits**
    - If nitrate levels at Te Waikoropupū are OK then there is not an issue with releasing water
    - This option addresses the public perception that the Allocation Limit is a problem because it is seen as being directly tied to water quality issues arising from dairy farming (acknowledging that there may not be a direct link between water use and water quality outcomes in this catchment) - this approach will be acceptable to the public
    - We cannot be sure that the land use rules will make a difference to water quality, so this approach is one way of reassuring the community that those potentially responsible for water pollution will not get water unless water quality is maintained
- **Importance of Te Waikoropupū:**
    - Te Waikoropupū is sacred to iwi and the public
    - The stepped approach is an expression of respect, where if we are serious about enduring solutions for water management (and Te Waikoropupū as an iconic expression of this) a bit more time in determining whether water should be allocated or not, is of no real detrimental consequence.
    - The first right of water is to water – so staging the release recognises this by ensuring water quality is provided for, before allocating more water.

FLAG members that don't support the staged approach, have the following reasons:

- Lack of linkage between allocation limits and water quality – water quality issues can arise from other mechanisms than water use, such as high rainfall, or from poor practice on unirrigated land uses
- Staged release of allocations produces uncertainty for future water permit applicants

- Farming practices have been improving over the last ten years and the proposed water quality management, including the risk to water framework will assist in this continuing.

16.6.6 Allocation accounting in the Arthur Marble Aquifer Recharge Zone

The approach defining which catchments, and their associated consumptive takes, are managed under the Arthur Marble Aquifer Recharge Zone reflects our understanding of how the various catchments contribute to flows to groundwater (refer Table 17) that may then influence Te Waikoropupū springs. It uses a conservative approach when assuming the amount of influence at the springs (as explained in the table and text below).

Table 17 Summary of catchment areas that potentially influence flows at Te Waikoropupū

Waterbody	River losses to groundwater	Assumed influence on Waikoropupū	Percentage of takes accounted within AMA Recharge Zone
Upper Tākaka Mainstem	**Up to 100%** *depending on conditions*	**100%** *(this is conservative as estimates of influence on the springs are between 47-58%[152])*	**100%**
Upper Waingaro (above the confined-unconfined AMA boundary)	**6%** (±6%, ie 0-12%)[153]	**8%** *(this is based on the average losses during low flows)*	**8%**
Tākaka tributaries (in the Tākaka Remainder zone)	**Up to 100%** *depending on conditions – many dry up over summer*	**100%**	**100%**
Confined Arthur Marble Aquifer	NA	**100%** *(this is conservative as only 2/3 of aquifer flow outflows at the springs[154]and the confined part is pressurised)*	**100%**
Marble Outcrop areas in Upper Motupipi / Pohara areas	**Up to 100%** *depending on conditions*	**100%**	**100%**
Anatoki	*None over unconfined AMA*	**0%**[154]	**0%**

The zones contributing to the Arthur Marble Aquifer Recharge Zone also need to protect their respective surface water bodies.

The management of the Waingaro River needs to consider both the upper and lower parts of the Waingaro zone together: water takes may be sought to be transferred between the upper and lower areas for efficient water use, with no significant effect on the river, but potential changes to effects on the Arthur Marble Aquifer Recharge Zone. For these reasons, a policy is recommended by Council staff to ensure any transfer of water from the lower to upper Waingaro requires consideration of the allocation limit in the Arthur marble Aquifer Recharge Zone, and FLAG supports this approach[155].

[152] Refer Stewart 2018, Edgar 1998, Mueller 1991 and 1992,
[153] Refer GNS 2001
[154] Refer Stewart & Thomas 2008
[155] This has not been specifically listed in a FLAG recommendation, but we expect Council staff to include this in development of the Tākaka Freshwater Plan Change under FLAG recommendation 12.

Consumptive water takes from the confined part of the Arthur Marble Aquifer (AMA) are unlikely to affect flows at Te Waikoropupū springs to a measurable level. This is because the confined part of the aquifer is pressurised and flows remain artesian at the springs. In addition, water takes from areas that are down gradient of the springs are likely to be taking water from flows that go to the sea, rather than the springs.

However, because of uncertainties in the subterranean plumbing and a desire to be precautionary, a conservative approach has been taken with 100% of consumptive water takes from the confined part of the Arthur Marble Aquifer also being included in the AMA Recharge Zone accounting. Further, the AMA Recharge Zone allocation limit is based only on flows through Te Waikoropupū springs and not on the total aquifer flows – ie it does not include consideration of the amount of aquifer water going out to sea. This adds a further degree of conservatism.

In addition, the area of unconfined Arthur Marble Aquifer underlying the upper parts of the Motupipi and Pohara-Clifton Zones has been included in the AMA Recharge Zone accounting. For the same reasons above, this is a conservative approach as Arthur Marble Aquifer flows in these areas are unlikely to flow to Te Waikoropupū. Groundwater takes from the Arthur Marble Aquifer in this area are managed together with the confined AMA, in the Lower AMA Zone.

In summary, the accounting of water takes for the AMA Recharge Zone includes:

- 100% of consumptive takes in the Upper Tākaka Mainstem Zone
- 100% of consumptive takes in the Tākaka Remainder Zone
- 8% of consumptive takes in the upper Waingaro Zone
- 100% of consumptive takes in the Lower AMA Zone – which includes the confined part of the AMA and the unconfined parts underlying the Motupipi and Pohara-Clifton zones

but excludes consumptive takes from the Anatoki Zone.

Using this accounting methodology, the current consented amount (as of 30 April 2019) in the Arthur Marble Aquifer Recharge Zone is 408 l/s[156] from the following zones:

- Upper Tākaka Mainstem: 100% of 239 l/s
- Upper Waingaro: 8% of 143.4 l/s (11.5 l/s)
- Tākaka Remainder 100% of 142 l/s
- Lower Arthur Marble Aquifer Zone:
    - Confined AMA: no takes currently, 0 l/s
    - Marble outcrop areas: 100% of 11.1 l/s

The water permits in the Tākaka FMU come up for renewal in 2019. The bona fide review of actual use during renewal or any unrenewed or lapsed consents may result in these numbers changing.

[156] To avoid confusion if referring to previous information on allocation accounting, this number has changed over the course of the FLAG process due to modifications to the accounting method – largely the removal of the lower Waingaro from the earlier accounting, plus addition of Motupipi-Pohara areas and changes to individual consents in the zones.

16.7 Managing water quality – further information

16.7.1 Current state of water quality in the Tākaka FMU

Water quality in the Tākaka FMU is generally very good in most places and in some cases exceptional[157].

Key water quality characteristics for the FMU are summarised below:

- Te Waikoropupū springs is recognised for its extremely high water clarity, and rivers in the FMU generally have water clarity well above the national average.

- Onekaka is known for its very high fish diversity (13 species recorded at one site) and a similar level of diversity is expected for other coastal catchments that have good riparian and aquatic habitat.

- Regional monitoring shows that approximately 97% of the time (in dry weather) bathing water sites comply with the guidelines for swimming water quality and meets the regional target for swimmability. Two Tākaka FMU sites with issues are listed in Table 18 below.

- In general, nutrient concentrations in the FMU are low. Waterways with the highest nitrate and ammonia concentrations are well below levels considered toxic to fish and stream invertebrates[158].

- Council's monitoring of groundwater quality[159] shows that groundwater nitrate concentrations across the FMU are generally low and stable across the Tākaka valley. Sites with sufficient data show relatively stable nitrate concentrations overtime with no obviously discernible trends (increasing or decreasing).

- At Te Waikoropupū Springs nitrate levels have increased over the 47 year data period (1970-2017) by approximately 0.1mg/L, with pre-2000 data containing 0.30-0.40 mg/L, and a median between 2007-2017 of 0.41mg/L[160]. Nitrate levels between 0.40 and 0.50mg/L represent a healthy ecosystem[161].

- Fine sediment content of stream beds is also generally low, but can be high in spring-fed streams and is occasionally an issue downstream of poorly controlled land disturbance activities.

- Monitoring of the Motupipi estuary in 2018 (Wriggle Jan 2018) indicated the intertidal areas had minimal macro algal growth and macro invertebrate communities were in relatively good condition, however there are some symptoms of nutrient enrichment in places,

[157] For example water clarity at Te Waikoropupū.
[158] Waterways with high nitrate and ammonia, often have high coverage of filamentous green algae, which results from multiple factors, including nutrients, lack of flushing flows and a lack of shading.
[159] Refer staff memo to Council at Environment and Planning meeting (E&P Managers report) 3 August 2017, the draft information was summarised to FLAG in 2016.
[160] Refer 'Ecosystem Health of Te Waikoropupū' (Cawthron, 2017)
[161] Refer Cawthron 2017 – see page 3 (internal title page) of the report for a list of the experts involved in this assessment. Water quality was further discussed during the Water Conservation Order hearing and it is anticipated the Special Tribunal will make recommendations on water quality standards at Te Waikoropupū.

including where the Motupipi River outflows, and ongoing issues with muddiness (some likely historic).

Further information on water quality in the FMU is available in Council's State of the Environment reports[162].

Most of the FMU zones and attributes are in a 'maintain existing quality' state, with some in a 'monitor' state due to lack of information[163]. However, there are several water bodies or parts of water bodies with existing localised and recurrent issues where water quality attributes are in an 'improve' state (refer Table 18). Figure 20 shows a summary of the zones and sites where water quality is good, and where there are issues to address, or risks to manage in the Tākaka FMU.

[162] State of the Environment reports on river water, groundwater and bathing water quality and the Motupipi estuary are available on the Council's website.
[163] Refer Table 5 and 12 in the FLAG interim report (FLAG November 2016)

Table 18 Waterbodies in Tākaka FMU with water quality to be improved

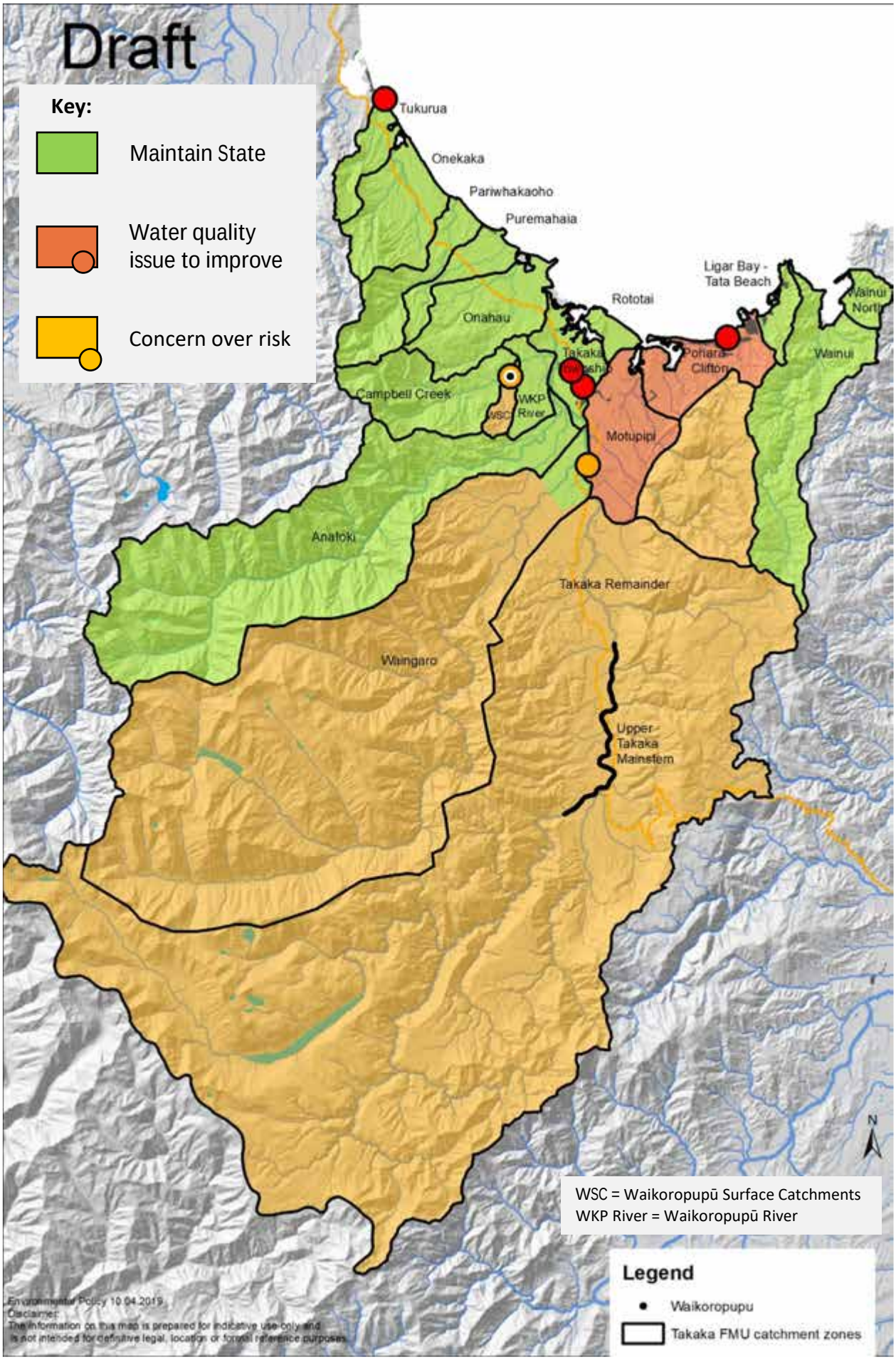
Water body or reach	FMU Zone	Issue to be addressed	Likely cause(s)
Te Kakau Stream	Tākaka Township Zone	Dissolved oxygen, aquatic weed growth (*Lagarosiphon*), temperature, shading and habitat	Lack of shading from riparian vegetation, exacerbated by reduced spring and flushing flows (from changes to Tākaka River bed level)
Lake Killarney	Tākaka Township Zone	Water clarity and phytoplankton blooms	Stormwater discharging to lake (being diverted away from lake in June 2019)
Motupipi River and tributaries	Motupipi Zone	*E.coli* affecting swimming (particularly at Rototai) and stock water /secondary contact, nitrates, phytoplankton blooms, aquatic weed growth, fine sediment deposition, water temperature (in tributaries), dissolved oxygen, shading and habitat	Lack of riparian vegetation, reduced spring and flushing flows (from changes to Tākaka River bed level), elevated nitrate levels from spring flows and run-off, *E.coli* from farm run-off and small unfenced tributaries and sediment from farm run-off, raceways bank erosion and earthworks.
Tākaka Limestone Aquifer	Motupipi and Pohara-Clifton Zones	Elevated nitrate levels	Septic tank discharges[164] and farm runoff
Pohara Creek and Beach	Pohara – Clifton Zone	Recurrent faecal indicator bacteria alerts for beach bathing quality	Unknown[165], possibly naturally occurring population in beach and creek sediments
Tukurua River mouth and beach	Tukurua Zone (Coastal Western Catchments)	Recurrent bacteria alerts for bathing quality	Previous sources found to be septic tanks, water troughs and stock loafing areas
Small unshaded creeks in pastoral lowland areas (eg Clifton, Wainui Bay)	All	Poor adult fish habitat, lack of spawning habitat, elevated water temperatures, aquatic weed growth	Riparian and aquatic habitat loss and lack of shading, poor in-stream habitat in many cases from maintaining streams as straight, incised channels.
Fish Creek	Waikoropupū Surface Catchments	Microbial pathogens - impact on mauri and potential visitor health risk[166].	Farm run-off in Fish Creek catchment

[164] Refer Aqualinc, 2017

[165] Previous investigations into typical sources of bacteria have not identified a likely source

[166] Anecdotal accounts suggest visitors to Waikoropupū are filling up water bottles, presumably to drink, at the bridge crossing Fish Creek. Generally, surface water bodies are considered unsafe for drinking without treatment because of the potential natural presence of microbial pathogens however the risk indicated from elevated *E.coli* levels at this location warrants further consideration because of the high level of visitor numbers.

Figure 20 Tākaka FMU - Water Quality Risk Summary Map



16.7.2 Risks from land and water use

16.7.2.1 Current land use

Land use on the Tākaka valley plains is predominantly dairy farming, with areas of sheep and beef, deer, and horticulture, including kiwi fruit, as well as land based aquaculture (salmon farming), and limited areas of pine forest. In places around the periphery of the plains, particularly in the Motupipi and Clifton area, there is rural-residential or 'lifestyle block' land use. Much of the upper catchment areas are in national or forest park under Department of Conservation management. Tākaka township and the communities from Pohara to Tata are the most densely populated areas in the FMU.

The risks from these particular land uses are briefly described below.

Farming and horticulture

Horticulture, forestry, cropping and pastoral farming can all have variable effects on water quality depending on on-farm practices, crop or stock type, and localised farm conditions, including soil type, slope, rainfall and the presence of water bodies or pathways to water[167].

Risks from these land uses include discharge of contaminants (in particular sediment, nutrients and microbial pathogens) and effects from waterbody management, including riparian vegetation and aquatic habitat loss.

Dairy land use is of particular concern to parts of the community because of its national reputation for poor practice resulting in contaminant discharges.

Dairy has seen a decrease in stock numbers in the FMU over the last ten years, but an increase in productivity per cow. The typical herd size in Tākaka is below the national and South Island averages, and irrigation is generally used to achieve consistent grass growth throughout the year, rather than to increase stocking density. More cropping is occurring, such as fodder beet and maize, as supplementary feed is expensive to transport into the Bay.

On-site wastewater systems

The urban areas of Tākaka, and Pohara to Tata, are reticulated for wastewater and the Tākaka wastewater treatment plant is monitored regularly to ensure it is operating within its consented conditions, however properties in the remainder of the FMU have onsite wastewater. Onsite wastewater is a potential source of both nutrients and microbial pathogens, especially from older systems, or those that are poorly designed/located or poorly maintained. Anecdotal accounts suggest some systems may be discharging directly to karst tomo (caves and open sinkholes), but this has not been confirmed. Development of more houses in unreticulated areas will mean more onsite discharges. There is also potential for peaks over summer with tourist influx, which can potentially overwhelm systems.

Tourism is also increasing[168], which can increase impacts to waterbodies and water quality. The effects of tourism can be difficult to define, given indirect impacts from the local production of goods and services used by tourists.

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[167] Refer AgResearch 2010

[168] Tourism in Tasman (for the year ending February 2019) had an estimated $297 million spend, with 1% growth year to year (MBIE 2019).

Activities relying on good water quality

On the flip side tourism often relies on high water quality - like the local community, visitors have an expectation of being able to swim in clean water (rivers and coast) and New Zealand tourism is marketed on these expectations.

In the marine area, spat catching at Wainui Bay and mussel farming in the wider Golden Bay are key production uses potentially affected by the quality of freshwater outflows, particularly microbial pathogens.

16.7.2.2 Linking risk sources to observed water quality

The water resources in the Tākaka FMU are an incredibly complex system. We have knowledge around potential inputs to this system from modelling of differing land use types, and knowledge of actual measured water quality in both surface and groundwater bodies throughout the catchments (although not to the same level of detail or length of time in all water bodies or all areas due to sampling resourcing constraints). However, little is known about the groundwater and karst systems, including the unground plumbing and how these environments assimilate or attenuate contaminant inputs.

This uncertainty makes it difficult to attribute the water quality results observed at downstream sites, such as Te Waikoropupū Springs, to specific sources in the contributing catchments.

Rather than seeking to spend further money understanding the complex subterranean system (with no guarantee of better understanding of attribution), FLAG discussed what we did have control over – namely the inputs into the system. From this FLAG agreed two key assumptions:

1. *Particular land uses (and practices) generate contaminants that can affect water quality and management should focus on these sources (for example dairy land use)*

2. *Different catchment areas have different influences on the rivers, aquifers and Te Waikoropupū - and our management should reflect these connections.*

This led naturally to a focus on those aspects that can be changed by users, namely the land uses, land use practices (including waterbody management), and associated point and diffuse discharges that could influence water quality of receiving environments (ie the green arrows in **Error! Not a valid bookmark self-reference.**). The freshwater objectives in the receiving water bodies are then used to define what success looks like when the inputs are managed correctly.

Figure 21 shows a basic schematic of the key inputs, outputs and processes that influence Risk to Water and how well we generally understand each aspect (refer shaded circles). For some aspects we can readily measure the input or output and Council holds good datasets, for others we may be able to gather data, but Council doesn't currently hold this data, and for others in can be difficult to gather any data (eg for natural processes occurring in deep aquifers).

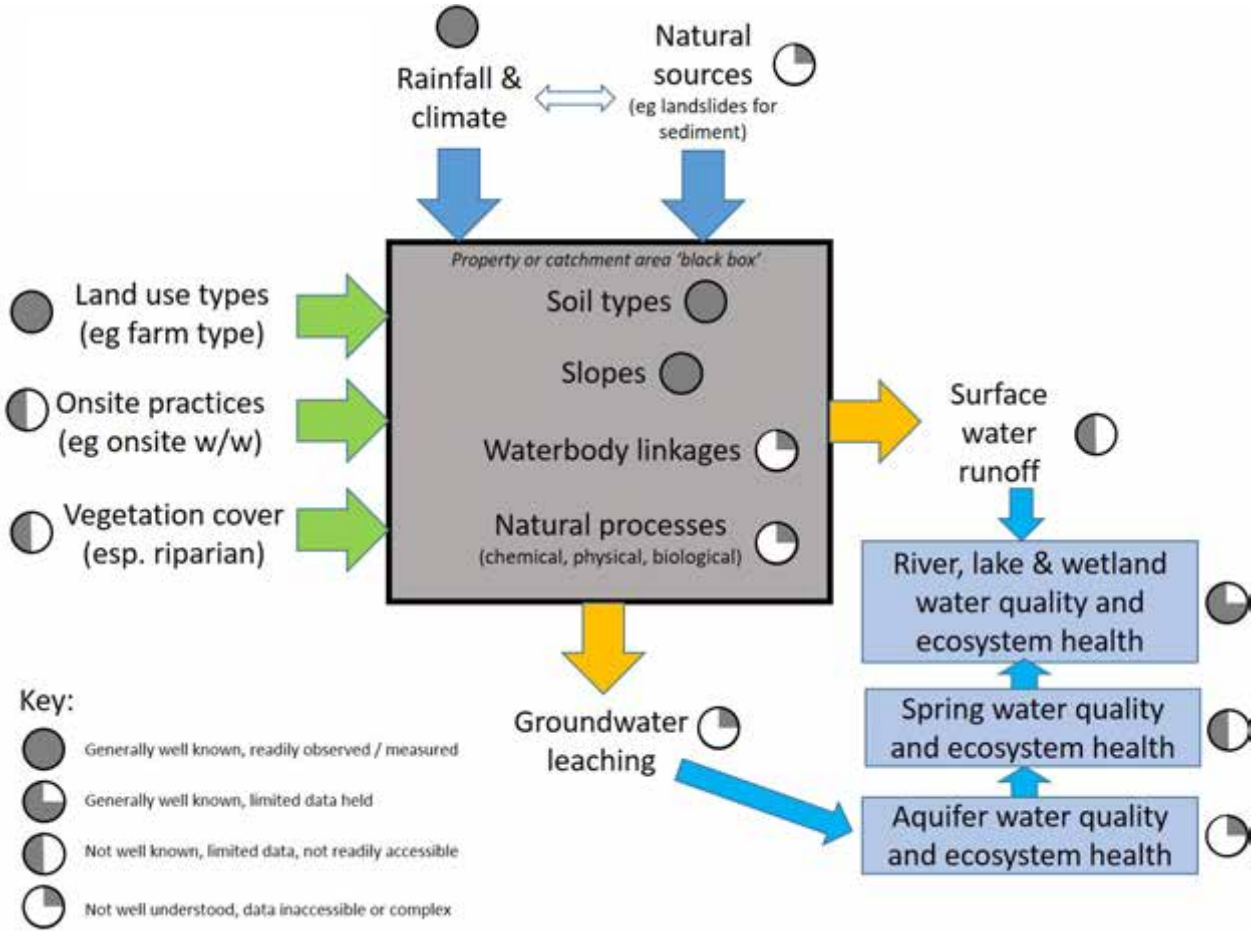
Rather than seeking to spend further money understanding the complex subterranean system (with no guarantee of better understanding of attribution), FLAG discussed what we did have control over – namely the inputs into the system. From this FLAG agreed two key assumptions:

3. *Particular land uses (and practices) generate contaminants that can affect water quality and management should focus on these sources (for example dairy land use)*

4. *Different catchment areas have different influences on the rivers, aquifers and Te Waikoropupū - and our management should reflect these connections.*

This led naturally to a focus on those aspects that can be changed by users, namely the land uses, land use practices (including waterbody management), and associated point and diffuse discharges that could influence water quality of receiving environments (ie the green arrows in **Error! Not a valid bookmark self-reference.**). The freshwater objectives in the receiving water bodies are then used to define what success looks like when the inputs are managed correctly.

Figure 21 Schematic of inputs, outputs and processes influencing Risk to Water and general level of understanding



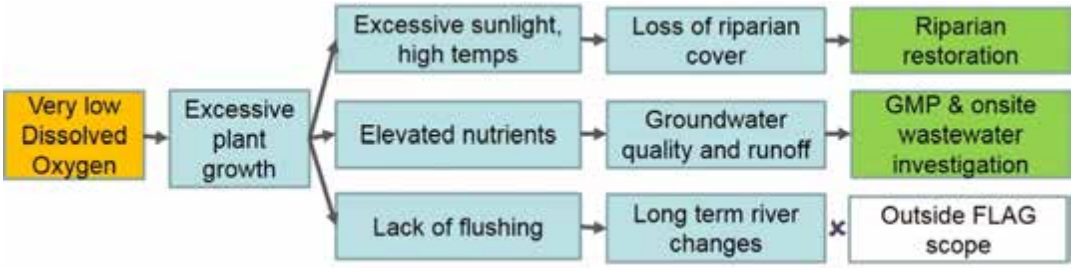
16.7.3 Managing the root causes of issues

In considering how to manage water quality issues and risks, we (with advice from Council staff) have focused on identifying the likely root causes of current water quality issues and potential sources of future risk in the FMU, so that management targets the root cause.

To illustrate this approach, Figure 22 uses the example of poor dissolved oxygen levels in the Te Kakau stream. The cause of the low dissolved oxygen is over growth of aquatic weeds (i.e. *Lagarosiphon*). The aquatic weed growth, is caused by excess sunlight and water temperatures, and exacerbated by a lack of flushing flows, and potential elevated nutrients from runoff or groundwater. The excess light and water temperatures arise from a lack of shading from riparian

trees and shrubs. The most appropriate long term solutions to the dissolved oxygen problem is therefore planting of the stream banks to provide shading, and addressing any potential nutrient sources.

Figure 22 Water quality causes flowchart



16.7.4 Use of Overseer

Overseer provides a useful tool for farmers to compare farming systems as part of their farm planning systems. We discussed Overseer as a tool for use in limit setting and regulation, and agreed this was is not yet a suitable use of the tool, as there is too much variability in the modelled nutrient loss rates, and there can be issues with version control, and its use for differing land use types.

Overseer outputs have been used to inform the catchment model (Aqualinc 2017), however we have not used the catchment model to inform the regulatory elements of the allocation or water quality frameworks we have developed. We have only used the catchment model - as recommended by Aqualinc and Landcare Research staff - as a means of relative comparison for understanding possible future scenarios for water and land use change in the FMU.

16.7.5 Draft Risk To Water components

FLAG were initially working towards provision of draft plan change content, including the Risk to Water Framework, for our recommendations to Council, however we consider that confirmation of the details and method of implementation for this is best progressed by Council, in conjunction with local industry, iwi and the wider community. We are happy as individuals to be invited to attend any engagement hui or meetings if you believe this could add value to the discussions – for example in sharing the nature of discussions and considerations we have already canvased in relation to farm environment planning.

We have included the following draft content to provide you with an idea of the type of content that could make up the Risk to Water Framework. We have not sought to achieve FLAG consensus on this specific detail. We are all in agreement on the need for everyone to be operating at good practice, and that landowners undertaking farm environment planning, which addresses site-specific risks to water, is an appropriate expectation for those undertaking activities with moderate to high risks to water in the Tākaka FMU.

These are draft suggestions for the Tākaka FMU, still requiring work on wording, and consideration of implementation approach.

16.7.5.1 Registration of land uses and permitted activities with Council

Staff have advised that Council currently do not hold key information such as land uses or permitted activities, to inform which properties would be subject to Risk to Water planning requirements.

Obtaining this information could involve online registration with Council to provide basic information, on:

- **land use types undertaken** - to enable Council to identify which properties in the FMU are considered Moderate to High Risk to Water land uses and therefore need to undertake Risk to Water planning
- **presence of on-site wastewater** – to inform an auditing program, and targeted education and advocacy work
- **permitted water takes** – to enable assessment of potential cumulative effects of permitted takes, and to inform the portion of allocation limits needed to provide for permitted takes

Council staff have advised that they have sought to obtain up-to-date land use information from existing sources, such as New Zealand Biosecurity and Statistics New Zealand, through the Open Government project, however the information held by central government ministries is not currently available to regional councils at a property level. Further work on minimizing multiple requirements from landowners of similar information may be addressed through the "Integrated Farm Planning Work Stream" being run by the Ministry for the Environment and Ministry for Primary Industries.

16.7.5.2 Risk to Water plans – Draft minimum required content

This minimum required content could be included either in regulation or offered initially as non-regulatory advice – either approach should be implemented with land advisory support from Council and industry bodies. It is anticipated if behaviour change does not result throughout the catchment within a reasonable timeframe, then a TRMP rule would need to become active and enforceable.

A Risk to Water Plan should contain as a minimum:

1. The property or enterprise details:

(Note: if obtained through an online registration process as discussed in Section 16.7.5.1 this would not need to be gathered again)

a) The following information in respect of the land owner, and the person responsible for using the land (if different from the land owner):
   i. Full name
   ii. Trading name (if applicable, where the owner is a company or other entity)
   iii. Full postal and email address
   iv. Telephone contact details
b) The physical address and ownership of each parcel of land (if different from the person responsible for the property or enterprise)
c) Legal description of each parcel of land as per the certificate(s) of title
d) Any relevant farm identifiers such as the dairy supply number, Agribase identification number
e) Rating valuation reference(s) of the parcels of land (for data correlation purposes)
f) Physical address of the property.

2. Identification of Risks to Water

The identification of all risks to water of all point source and diffuse contaminant discharges of sediment, nitrogen species, phosphorus species and microbial pathogens associated with the activities on the property, and an assessment of the priority of those identified risks.

As a minimum, the risk assessment should include (where relevant to the particular land use):

a) A description of waterbody setbacks and riparian management, including:

    i. The management of water body margins, including how damage to the bed and riparian margins of water bodies, and the direct input of contaminants will be avoided, and how riparian margin settling and filtering will be provided for

    ii. how the waterbody setback distances in the minimum standards (refer section 11.2) will be achieved

b) A description of the critical source areas or activities from which sediment, nitrogen species, phosphorus species, microbial pathogens and any other relevant contaminants may be lost, including:

    i. the identification of intermittent waterways, overland flow paths and areas prone to flooding and ponding, and an assessment of opportunities to minimise losses from these areas (e.g. detention bunds, sediment traps, natural and constructed wetlands)

    ii. the identification of actively eroding areas, erosion prone areas, and areas of bare soil and measures for erosion and sediment control and re-vegetation (including strip-grazing or break-feeding being undertaken in a down-gradient direction starting at the highest elevation within the paddock)

    iii. an assessment of the risk of diffuse discharge to waterways of sediment, nitrogen, phosphorus and microbial pathogens from tracks and races, livestock crossing structures and overland flow paths, and the identification of appropriate measures to minimise these discharges (e.g. cut-off drains, land contouring, constructed wetlands)

    iv. the identification of areas where effluent accumulates and appropriate measures to minimise the risk of diffuse discharges of contaminants from these areas to groundwater or surface water (eg yards, races, livestock crossing structures, underpasses, stock camps, feed-out areas, water troughs)

    v. the identification of other potential 'hotspots' and the appropriate measures to minimise the risk of diffuse discharges of contaminants from these areas to groundwater or surface water (eg fertiliser, silage, compost, chemical, or effluent storage facilities; wash-water facilities; offal or refuse disposal pits; and feeding or stock holding areas)

    vi. the identification of all onsite wastewater systems for domestic wastewater and the appropriate measures to minimise the risk of diffuse discharges of contaminants from these areas to groundwater or surface water

    And for each of the above assign a reference to priority of risk using a low-medium-high-critical scale (definitions to be determined)

c) An assessment of appropriate land use and where applicable, grazing management for specific areas on the property in order to maintain or improve the physical and biological condition of

soils and minimise the diffuse discharge of sediment, nitrogen, phosphorus and microbial pathogens to water bodies, including:

i. matching land use to land capability
ii. identifying areas not suitable for grazing
iii. stocking policy to maintain soil condition and pasture cover
iv. the appropriate location and management of winter forage crops
v. suitable management practices for break feeding

d) A description of cultivation management, including:
   i. The identification of slopes over 15 degrees and how cultivation on them will be avoided; unless contaminant discharges to water bodies from that cultivation can be avoided; and
   ii. How the adverse effects of cultivation on slopes of less than 15 degrees will be mitigated through appropriate erosion and sediment controls for each paddock that will be cultivated including by:
      1. assessing where overland flows enters and exits the paddock in rainfall events
      2. identifying appropriate measures to divert overland flows from entering the cultivated paddock
      3. identifying measures to trap sediment leaving the cultivated paddock in overland flows
      4. maintaining appropriate buffers between cultivated areas and water bodies (meeting minimum setback rules)

e) A description of collected animal effluent management including how the risks associated with the operation of effluent systems will be managed to minimise contaminant discharges to groundwater or surface water

f) A description of freshwater irrigation management including how contaminant loss arising from the irrigation system to groundwater or surface water will be minimised

g) Identification of any instream structures which may pose a barrier to fish passage, including how these will be maintained or operated to enable fish passage

h) A description of the methods by which stock shall be excluded from water bodies.

3. A description of the actions and their timing

A description of the actions that will be undertaken in response to the risks identified in the risk assessment above (having regard to their relative priority as listed in Table A), as well as where the actions will be undertaken, and when, and to what standard they will be completed.

Table A - Action Implementation Priority and Timeframes

Priority of Risk	Priority of Action	Maximum timeframe to implement Action from date of RTW plan or latest RTW plan review
Critical	All	1 month
High	High	3 months

	Moderate	6 months
	Low	12 months
Medium	High	6 months
	Moderate	12 months
	Low	18 months
Low	High	2 years
	Moderate	3 years
	Low	5 years

4. Property map or maps including:

a) Critical sources and critical pathways of off-site discharges of microbial pathogens, sediment, nutrients (nitrate and phosphorus) and any other relevant contaminants (in the applicable FMU), including:
   i. Property boundaries
   ii. Locations of continually or intermittently flowing rivers, streams, and drains, and any lakes, ponds, sinkholes, and wetlands
   iii. Locations of concentrated overland flow paths that flow to a water body, sinkhole or across a property boundary
   iv. Locations of any stormwater reticulation, and impervious areas draining to reticulation or waterbodies
   v. Locations used for any existing activity that may produce contaminant discharges, including: offal and refuse disposal or storage, storage of silage, effluent storage, effluent discharge to land, compositing, onsite wastewater systems (including long drops and composting toilets), chemical storage or use, dairy sheds, holding pens, yards, raceways, water troughs and feed pads, stand-off pads, multiple vehicle storage, sealed carparks, or yards
   vi. Paddock blocks with identification of paddocks used for effluent irrigation or disposal, cropping, wintering of stock, feed-pads or break feeding
   vii. Soil types.

b) Action map or maps at a scale that clearly shows:
   i. The boundaries of the property, including any relevant internal property boundaries that relate to risks and mitigation actions described in the Action Plan
   ii. The locations of existing and proposed mitigation actions to manage contaminant discharges
   iii. The location of any riparian vegetation and fences along water bodies.

16.7.5.3 Draft triggers for responsive management in the Arthur Marble Aquifer Recharge Zone

This section gives examples of the attributes and triggers that could be used in a responsive management approach in the Arthur Marble Aquifer Recharge Zone. The purpose of showing this information is to illustrate how responsive management could be triggered to the next management level.

The numbers in
Table 19 are based on a combination of the numbers identified in the Science Panel Report (Cawthron, March 2017) and information provided to the Special Tribunal by Council at the WCO hearing. The intention is that the triggers would operate below any water quality standards identified in a WCO.

We have not sought FLAG consensus on these triggers, and anticipate that the recommendations of the Special Tribunal for the Waikoropupū Water Conservation Order (WCO) will provide guidance on suitable triggers and enable consideration of how the approach could be used to support the outcomes desired in a WCO.

It is intended that the triggers result in further actions and information provision to enable Council, industry groups and landowners to assess risks and target management responses, and could include for example:

- Trigger 2 reached:
  - More detailed information provision to Council as part of the Risk to Water planning requirements to improve understanding of catchment sources and pathways of risk
  - Higher levels of good practice to be actioned
  - Increased compliance and auditing requirements
- Trigger 3 reached:
  - Monitoring of water quality by landowners to establish farm-specific effects
  - Changes to activity status (ie requiring resource consent) for certain land uses or practices

*Table 19 DRAFT **Arthur Marble Aquifer Recharge Zone - Te Waikoropupū Springs Responsive Management Trigger Levels***

Attribute	**Monitoring metric**	**Location of measurement**	**Freshwater Objective** (Desired Attribute State)	**Trigger Level 1**	**Trigger Level 2**	**Trigger Level 3**[2]
(measured at Te Waikoropupū main spring basin)						
Nitrate	Annual median mg/L NO3-N/L	Te Waikoropupū main spring	≤0.40 [CD]	>0.40	≥0.50	≥0.55 *[WCO]*
Water clarity[1]	Annual median & 5th percentile (metres)	Te Waikoropupū main spring	AM: ≥70m 5%: ≥65m [*WCO]*			AM: <70m 5%: <65m *[WCO]*
Dissolved oxygen	Annual median Percent saturation	Te Waikoropupū main spring	≥55% *[CD]*	<55% *[CD]*	≤50% *[SPR]*	≤45% *[WCO]*
Dissolved Reactive Phosphorus	Annual median mg/L	Te Waikoropupū main spring	≤0.006 *[CD/SPR]*	>0.006 *[SPR]*	≥0.008 *[SPR]*	≥0.01 *[WCO]*

Table Notes:

1. *Water clarity as measured using a transmissometer – with monitoring over 3 months between October to January every 5 years.*
2. *Sources of numerical values:– refer square brackets – draft WCO limits, SPR=science panel report triggers, CD = current data range based, MIDR = mid range between other triggers*

16.8 Existing monitoring in the Tākaka FMU

As referred to in Section 13.3, Table 20 outlines the existing regular water quality sampling in the Tākaka FMU as part of the State of the Environment (SOE) monitoring programme. The SOE summary reports are available on Council's website.

Table 20 Summary of existing monitoring in Tākaka FMU

Water body type	Frequency	Number	Comment
River water quality	Monthly (since July 2016 – quarterly prior to this)*	11 sites (2010-2014) 5 sites (since July 2016)	Up to 14 attributes Data collected at base flow. Reference site at Harwoods prior to 2016.
Bathing water quality	Weekly / twice weekly between November and March	5 sites (Tukurua, Pohara and, Payne's Ford - every year); (Paton's Rock, Tata Beaches every 2nd year)	*E.coli, water clarity, periphyton in freshwater* and *Enteroccoci in marine waters* Sampling frequency increased if alert triggers breached. Site selection driven by risk and popularity.
Groundwater quality	Quarterly (4 times per year)	3 sites (Bores: WWD6342, WWD6601, WWD6013)	Tested for 15-20 attributes Tākaka Gravel at Tākaka township Tākaka Limestone near Central Tākaka Arthur Marble at Te Waikoropupū springs.
Groundwater quality (synoptic)	Once every 10 years	~60 sites	Done in 1996, 2006, 2016 (awaiting results analysis for 2016) Tested for 5-17 attributes Results will be included in the next SOE groundwater report update.
Water usage	Seasonally, based on weekly returns	86	Undertaken for compliance checks against consent conditions
Estuary quality	Reports for 2007, 2008 and 2015	Motupipi Estuary	Includes broad scale and fine scale habitat mapping and sedimentation

** This was changed to provide consistency with the other regional councils for national reporting, and meets the minimum statistical requirements recommended for attributes in the NPS-FM National Objectives Framework.*

16.9 Economic questions and potential costs of implementation

16.9.1 Key economic questions

This section outlines the economic questions raised during the FLAG process and outlines some of the potential costs for consideration in defining the recommended economic assessment.

The economic questions and concerns from FLAG and the community[169] have covered a number of themes:

1. **What value does water use provide to individuals and the local community?**
   a) Who is benefiting from water use and is this equitable? - Are a few individuals benefiting from use of a community resource, while the environment and/or community bear the costs of this use?
   b) What is the best value use of water to the community? - And how can we encourage transition over time to these 'better uses'?
   c) Should we avoid the benefits of water use leaving the local community - and if so how? (particularly as a result of water takes by companies owned outside of Golden Bay/Mohua or New Zealand)

2. **What will implementation of the FLAG recommendations cost, who benefits and who pays?**
   a) What are the costs and benefits to the environment?
   b) What are the monetary costs and benefits to the community (Council rate payers)?
   c) What are the monetary costs and benefits to individuals, including farmers and water users?
   d) What are the costs and benefits if we don't implement the recommendations and leave water management as is?

3. **Does the process and outcomes meet the requirements of the NPS-FM and RMA?**
   a) Does it enable the community to provide for their economic well-being, including productive economic opportunities, in sustainably managing freshwater quality and quantity, within limits?
   b) Does it meet relevant RMA Section 32 Evaluation requirements?

16.9.2 What value does water use provide to individuals and the local community?

The question of what is the best value of water to the community, and aspects such as foreign-owned benefit from use of water, are complex. The importance of water to the economy is both fundamental and difficult to define.

Individuals and the community benefit directly and indirectly from water use in a number of ways.

Individuals can benefit from fulfilment of basic needs, such as access to clean drinking water and necessary products, such as food, and generation of livelihood opportunities through employment or business equity and growth, or increases in land value.

The community as a whole can benefit from water use from flow-on effects from individual benefits, including community health from individuals access to clean, safe drinking water, and

[169] From public feedback during the public meetings and on the interim FLAG report (December 2016)

community economic growth and vibrancy from low unemployment, and the flow through of business equity, resulting from businesses needing the services and products of other businesses.

Conversely, many of these benefits, including livelihood opportunities and food production have potential adverse effects on water.

Council staff have advised FLAG that the Council has no clear mandate or mechanisms to control who gains use of local water resources, and that regulation of how water is used (ie enabling only certain end uses) is difficult to establish. As such, while we recognise the 'best value uses of water' as an important issue requiring further community discussion, we have not included its consideration in our recommendations package, but have instead identified this issue for Council to consider further in discussion with central government (refer Sections 15).

16.9.3 Potential FLAG recommendations costs

Examples of potential costs of the FLAG recommendations are listed below:

- **Council (and community through rates):**
  - Regulatory:
    - Plan change process costs, including potential for appeals
    - Compliance and auditing of the Risk to Water framework – depending on how this is implemented
  - Non-regulatory:
    - Increased Accounting and Reporting systems costs
    - Increased Monitoring and Investigations costs
    - Increased Education and Advocacy costs
    - Ongoing programmed Works and Services, including potential changes to river management and increased costs of waterbody restoration where this is not met by external funding
    - Ongoing Financial Measures (Tasman wide, not just in the Tākaka FMU)
- **Landowners:**
  - Costs of changes to meet minimum standards including:
    - Stock exclusion, where this has not already been done
    - Any changes needed to meet water body setbacks
    - Potential opportunity costs where changes affect previously productive use of land
  - Revision or creation of Risk to Water plans and potential auditing and compliance costs depending on how this is implemented
  - Costs associated with implementing action plans over time to minimise risk to water
  - Costs of waterbody restoration, both time and monetary.

FLAG members are concerned that there are also business risks landowners may face depending on the 'devil in the detail' and wish for Council to consider unanticipated and undesired consequences of the framework elements, such as the impact of the definition of land use intensification on current land use management.