Volcanic Ring Plain

FRESHWATER MANAGEMENT UNIT

Discussion document

Working with people | caring for Taranaki

Taranaki
Regional Council

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Purpose and contents of this discussion document

The purpose of this discussion document is to present the progress that Taranaki Regional Council has made on giving effect to the National Policy Statement for Freshwater Management 2020 (NPS-FM) requirements included in the National Objectives Framework (NOF). This is not a complete package of NOF requirements as it focuses on the initial and compulsory aspects of NOF.

This discussion document summarises previous feedback and presents the Council's progress on:

- attributes for ecosystem health and human contact and their baseline states;
- developing a Te Mana o te Wai (the mana of the water) objective;
- the draft long-term vision for the Freshwater Management Unit (FMU);
- the values at play within the FMU;
- draft environmental outcomes for each value within the FMU; and
- next steps for identifying additional attributes and setting target attribute states.

As with previous engagement, the Council is checking in and seeking feedback on a number of matters across the discussion document.

WE WANT TO HEAR FROM YOU

You can find where the Council is seeking specific feedback on this discussion document in the callout boxes of relevant sections. The specific questions the Council is keen to investigate are set out in the callout boxes in the following sections:

- Te Mana o te Wai
- Long-term vision for the Volcanic Ring Plain FMU
- Environmental outcomes for the Volcanic Ring Plain FMU
- Target attribute states

Responses can be made by taking the online surveys (available 25 September 2023) at www.trc.govt.nz/freshwater, attending one of our workshops or by writing to the Council at policy@trc.govt.nz

Table of contents

List of tables

List of figures

List of photos

About the Volcanic Ring Plain Freshwater Management Unit

The Volcanic Ring Plain FMU (**Figure 1**) stretches from the Waihi Stream and Waingongoro River in the south, around the coast to the Waiongana River in the north. The catchments of the Volcanic Ring Plain FMU are sourced from mountain springs and springs on the surrounding volcanic apron. Unlike other FMUs, this FMU contains a significant number of catchments. These are identified collectively due to the similarities across source waters, catchment typology, geology and soils (volcanic), climate (high rainfall) and, as a result of these physical qualities, the land uses (**Figure 2**) and industries which operate throughout.

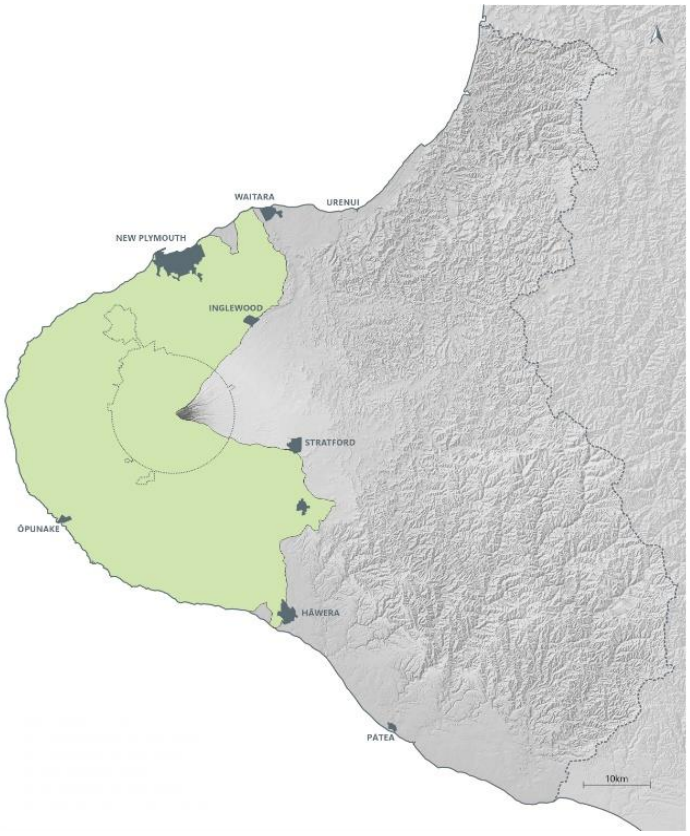

Figure 1 The Volcanic Ring Plain FMU (green) sitting within the broader Taranaki region.

In contrast to the waters of the Pātea and Waitara Catchment FMUs (which are also mountain sourced but travel inland where they mix with hill country sourced waters), the Volcanic Ring Plan FMU contains straight, steep and narrow catchments with cold, fast flowing water. Water travels relatively quickly from the mountains to the sea, minimising some impacts that might be seen in other warmer, slower moving streams with intensive land use (such as excessive algal growth).

Waters originating on Taranaki Maunga which pass through the rich and diverse alpine scrub and native forests of Te Papa-Kura-o-Taranaki (the national park) are some of the most pristine waters in the region. However, these waters contain significant amounts of naturally occurring phosphorous due to the volcanic geology.

Below Te Papa-Kura-o-Taranaki, native forest gives way to rolling pasture with large areas of riparian margins along the many rivers and streams. Numerous small lakes and tarns, along with more than 2,500 mapped wetlands are dotted across this FMU. Wetland condition and type varies significantly owing to significant drainage over the years as well as diversion and piping of natural watercourses. This FMU also contains the Hangatahua River (Stony River) which is a regionally identified outstanding freshwater body due to its outstanding natural characteristics and features. In 1985, it was granted a Local Water Conservation Notice, the first of its kind. The river is referred to in Māori mythology and is commonly regarded as the most sacred river in Taranaki. Additionally, it contains regionally important fisheries, scenic characteristics and recreational, cultural, historical and educational features.

The freely draining and rich volcanic soils, high rainfall, shallow groundwater system and gentle rolling topography make its lower extents exceptionally well suited to intensive agriculture. Here the average herd size is larger meaning that farming is more intensive than in the other FMUs. The frequent, and often intense rainfall events that occur on Taranaki Maunga erode the river banks and carry runoff from the surrounding land. This results in rivers and streams that are muddy and brown for a few days following each event.

Freshwater improvement has been a focus for the Council and Taranaki communities over the past 40 years. Positive changes in a number of freshwater indications have largely come about through work undertaken by industry and landowners to improve farm management practices, and to fence and plant streambanks through the Council's riparian management programme. Despite these changes, recent water quality improvement trends have slowed. There is a renewed focus on improvements for land-based pollution sources in catchments, such as installing effective oxidation ponds and dairy effluent irrigation systems. Further improvements are possible as new and innovative technologies and practices continue to be developed and adopted.

Photo 1 Wetland, Barrett Lagoon.

The rohe of Ngāti Ruanui, Ngāruahine, Taranaki and Te Atiawa iwi and 16 marae are located within the Volcanic Ring Plain FMU, who have long-standing and ongoing relationships with wai across the FMU through whakapapa. South west of New Plymouth, Parihaka is a nationally significant landmark and marae that symbolises the peaceful resistance to the confiscation of Māori land. Each iwi, hapū and whānau hold tikanga (protocols) and mātauranga (knowledge) relevant to the awa for which they are kaitiaki (guardians).

This FMU contains the largest urban area in the region, New Plymouth, which presents unique challenges for freshwater management with its varied and changing pollution sources. It also contains the towns of Hāwera, Manaia, Eltham, Kaponga, Ōpunake, Rahotu, Pungarehu, Ōkato, Oākura and Inglewood. Household water is supplied from water supply systems at Mangamahoe (New Plymouth), Inglewood, Oākura, Ōkato, Kapuni, Hāwera, Rahotu, Ōpunake, Waitemate West, Inaha, Cold Creek and Oaonui. Urban areas produce their own challenges for water quality including where and how much water is taken for municipal supply; contaminants from stormwater and wastewater discharges; culverting and piping of water bodies; drainage of wetlands and removal of vegetation for subdivision; and the need for flood protection to safeguard people and infrastructure.

This FMU is also a hub for industry, containing the country's largest grid connected solar farm at Kapuni; oil and gas fields and associated production facilities; electricity generation and transmission; Fonterra's lactose manufacturing factory plant; Ballance's ammonia urea manufacturing plant; and the ANZCO meat processing plant in Eltham.

The Volcanic Ring Plain FMU provides for a wide range of well-used recreational opportunities such as fishing, whitebaiting, boating and beaches, lakes and Te Papa-Kura-o-Taranaki. Ten sites, including at the Waingongoro River mouth, Oakura River mouth (Corbett Park) and Waiwhakaiho River (at Merrilands Domain) are routinely monitored for recreational water quality.

Photo 2 Children swimming in the Waiwhakaiho River.

The volcanic geology and laharic history of the area has given rise to a large number of inshore reefs which are valued by the community for their mahinga kai as well as

surf breaks. Despite the assimilating qualities of the Tasman Sea, the quality of freshwater in the Volcanic Ring Plain FMU does have an impact on inshore coastal water quality, particularly near the mouths of rivers and streams where people may be swimming, surfing or fishing.

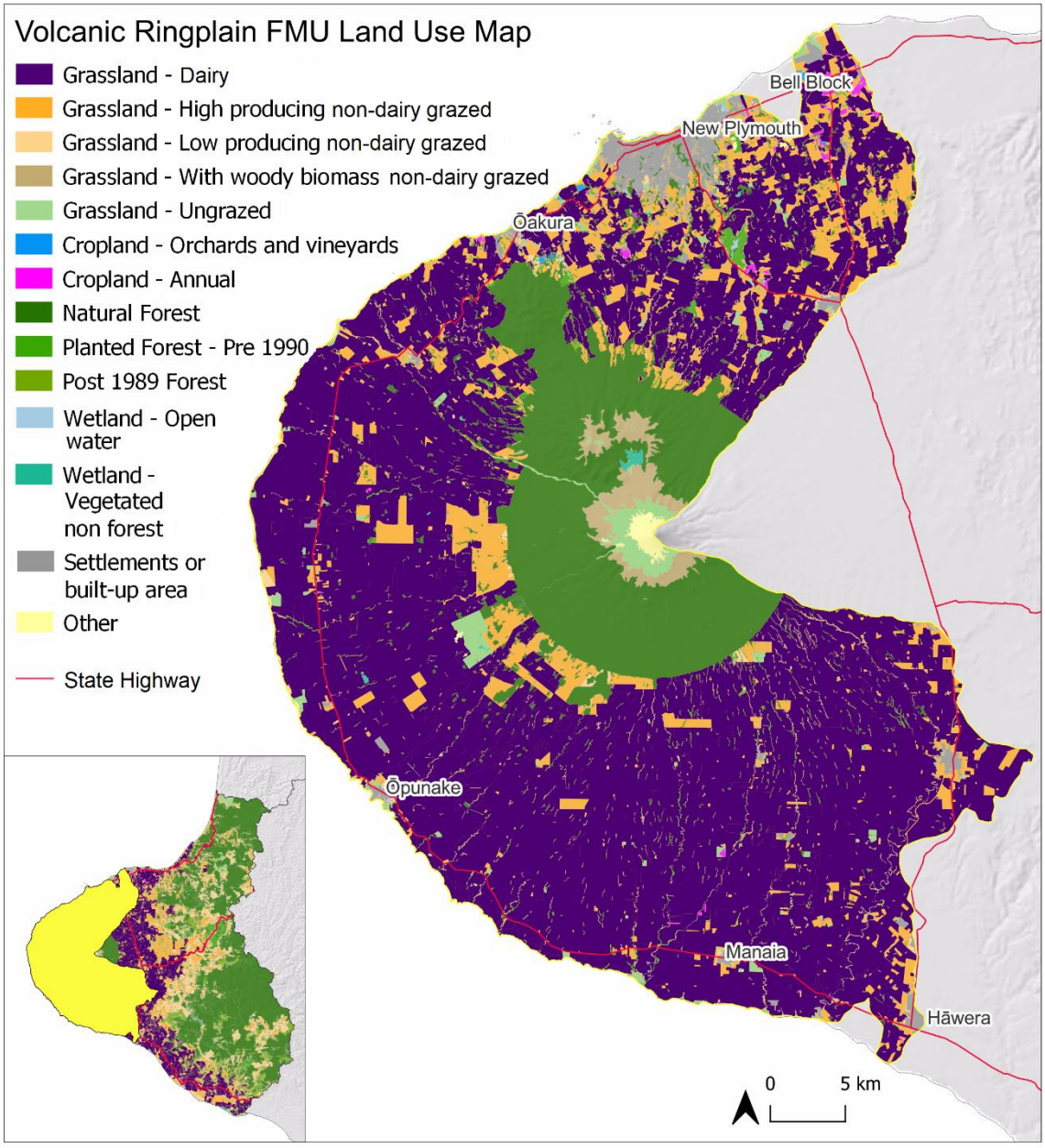

Figure 2 Indicative land use map for the Volcanic Ring Plain FMU.

Background

The future of freshwater management in Taranaki

The *National Policy Statement for Freshwater Management 2020* (NPS-FM) sets out requirements for the management of freshwater. It is part of a broader suite of national direction on freshwater called *Essential Freshwater*, covering a range of initiatives including synthetic nitrogen caps and freshwater farm plans.

The NPS-FM sets out requirements for freshwater management to:

- manage activities that impact freshwater in a way that 'gives effect' to Te Mana o te Wai;
- maintain and/or improve freshwater and address any degradation;
- implement the National Objectives Framework (NOF);
- avoid any further loss or degradation of wetland extents and to encourage their restoration;
- improve fish abundance, diversity and passage;
- monitor and report on freshwater quality and quantity; and
- respond to any identified deterioration of freshwater (including ecosystems).

Key to implementing these requirements is ensuring that the values and concerns of the Taranaki community, including tangata whenua, and stakeholders are considered and integrated into the response. It's about having the right solutions to suit Taranaki.

What is the NOF process?

The National Objectives Framework (NOF) is a process regional councils must work through in tandem with their freshwater plan reviews. The NOF process involves setting long-term visions (aspirations) for freshwater health, implementing changes to freshwater management approaches (e.g. rules and consents) and monitoring key elements of the state of freshwater to track progress toward achieving outcomes. The NOF process is applied to each Freshwater Management Unit (FMU). It is important to keep in mind that the NOF is only one part of a much broader policy framework and there are other freshwater considerations that will be addressed through region-wide provisions in the remainder of the regional freshwater plan.

Working through the NOF process will require changes to our current freshwater management system which will be implemented through a number of initiatives, including:

- the establishment and roll out of freshwater farm plans;
- the review of the existing Regional Freshwater Plan and relevant chapters of the Regional Policy Statement (notification of changes scheduled for the end of 2024);
- the development of targets and limits to address certain freshwater indicators; and
- the development of action plans to implement other regulatory and non-regulatory programmes to address tricky issues such as providing for fish passage and the protection of threatened species (post notification, likely in 2025).

More information on the NOF process can be found on the Ministry for the Environment website.

Previous engagement

This discussion document builds upon previous conversations with communities. These include:

- Engagement on long-term visions for Taranaki – In mid-2021 the Council undertook an initial consultation with the community on their aspirations for freshwater. This was conducted via an online survey and in-person workshop in New Plymouth.
- Stakeholder workshops – In April 2022, the Council conducted a number of workshops with different stakeholder groups. These workshops explored, at a high level, Te Mana o te Wai, vision setting and the challenges and opportunities for Taranaki in freshwater management.

- In late 2022 the Council undertook broad community consultation on draft Freshwater Management Units (FMUs), aspirations for freshwater and the values that apply across the region. This consultation was supported by FMU Storyboards - information pages for each draft FMU.

Partnering with tangata whenua

The Council has an agreement with Ngā Iwi o Taranaki to provide more meaningful opportunities for tangata whenua to be involved in NPS-FM implementation and the development of freshwater provisions in the Regional Policy Statement and the Regional Freshwater Plan. This agreement has resulted in the creation of two positions that assist Ngā Iwi o Taranaki to be involved in these work programmes. The work of these two positions has resulted in a number of position papers setting out the regional issues, aspirations for freshwater and regional approach to Te Mana o te Wai which brings Te Ao Māori perspectives to the fore to guide policy development and future engagement. These position papers have remained front of mind through the drafting process that has been undertaken in the preparation of this discussion document and will continue to be influential in policy development going forward.

This arrangement is the first of its kind for the Council and the partnership is continuing to be built as this work is progressed. The Council will continue to develop its understanding of these statements and work closely with tangata whenua in the future drafting and development of policy.

Freshwater Management Units (FMUs)

An FMU is a water body or multiple water bodies that the Council considers to be an appropriate scale for managing freshwater, including the setting of freshwater visions, objectives, targets, flows and limits. Every water body in the region must be located within one FMU. The draft FMU designations are set out in **Figure 3** below.

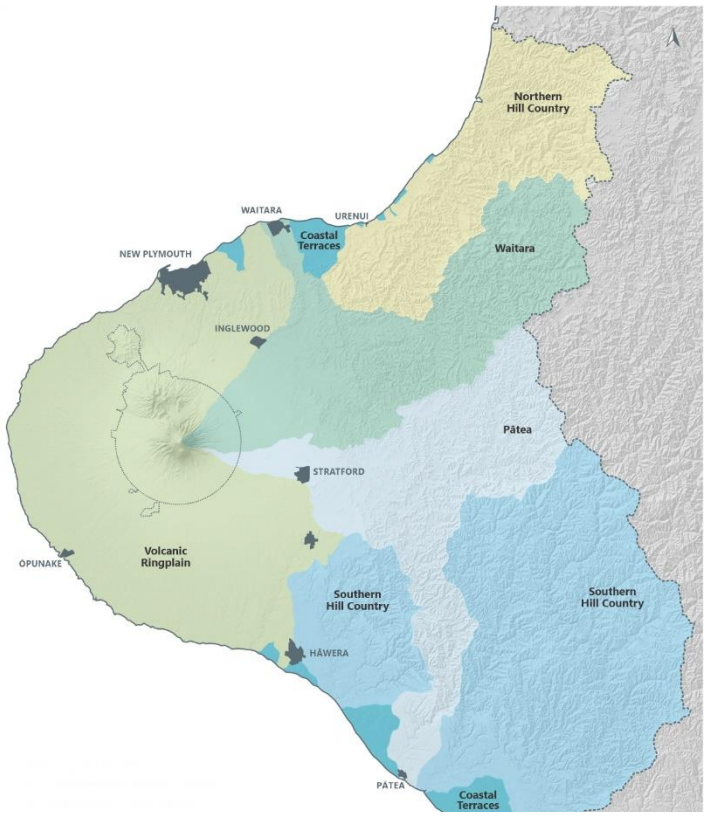

Figure 3 Draft Freshwater Management Unit designations for Taranaki.

In setting draft FMUs, the Council applied the following principles, recognising that there are multiple ways that the region could be spatially defined.

FMU designation principles:

- 'Ki uta ki tai' – source to sea approach, not splitting catchments across different FMUs;
- go with the wai - catchment boundaries should be used rather than property boundaries to delineate FMUs;
- designed to enable freshwater accounting requirements for limit and target setting (rather than being based on land use practices); and
- keep it simple – fewer FMUs will reduce complications and ensure the NOF is workable.

The feedback received was generally supportive of the six areas, however, there were some comments and suggestions for change. These included:

- noting that Taranaki is a small region with a large number of catchments which does not lend itself well to separation into FMUs;
- noting that the Pātea Catchment FMU fragments the Southern Hill Country FMU;
- suggestions to consider additional areas be added to the Coastal Terraces FMU;
- suggestions of separating catchments that rise in Te Papa-Kura-o-Taranaki from those that begin on the lower areas of the Volcanic Ring Plain FMU;
- suggestions to set the Waitōtara and Whenuakura as their own FMU.

The Council has given consideration to each of these suggestions. Noting that the proposed FMUs were widely supported by those who provided feedback, the Council considers that any concerns raised can be addressed through appropriate policy drafting, without the need to change FMU boundaries.

TAKE OUR SURVEY

Council is seeking feedback on the following sections:

- Te Mana o te Wai
- Long-term vision for the Volcanic Ring Plain FMU
- Environmental outcomes for the Volcanic Ring Plain FMU
- Target attribute states

Responses can be made by taking the online surveys (available 25 September 2023) at www.trc.govt.nz/freshwater, attending one of our workshops or by writing to the Council at policy@trc.govt.nz

Freshwater in Volcanic Ring Plain

Baseline states for compulsory attributes

Regional councils must identify baseline states (current or starting points) for a range of attributes or measures of freshwater health. Baselines provide the context for which councils must either maintain or improve freshwater.

Different attributes relate to different values, uses and interests. Of the four compulsory values, attributes are identified for two: ecosystem health and human contact. There are five components of ecosystem health that tell us about how well an FMU, or part of an FMU, supports freshwater ecosystems. These are:

- *Water quality* – measures the physical and chemical characteristics of water, such as temperature, dissolved oxygen and nutrients.
- *Water quantity* – how much water is in a river, stream, lake or aquifer and how this changes over time.
- *Physical habitat* – the shape and appearance of a body of water, from the bed to the banks and plants present.
- *Aquatic life* – the abundance and diversity of species living in freshwater, from insects and fish to plants and microbes.
- *Ecological processes* – the natural cycling of carbon and nutrients through the food chain.

Attributes are assessed using NOF bands. Generally, NOF bands range from bands **D** or **E** (poor) through to band **A** (good). The NPS-FM also sets out national bottom lines for some attributes. Catchments that fail to achieve a national bottom line are priority areas for the Council and communities to focus their efforts. Descriptions of each of the attributes and what they are used for are included in Appendix 1 – NOF attribute descriptions.

How we are doing

Ecosystem health is generally well understood throughout the Volcanic Ring Plain FMU. Gains have been made in recent years with significant investment in the fencing and planting of riparian margins. There are however waterways that need further improvement. Nutrients and sediments are elevated in some catchments due to a combination of natural conditions and human activities, which impact aquatic ecosystems. Periphyton is currently achieving the minimum standards for healthy freshwater, however, further monitoring is required to better understand algal growth in streams and rivers. Generally, the state of aquatic life is mixed, with most monitored sites showing some degree of impact.

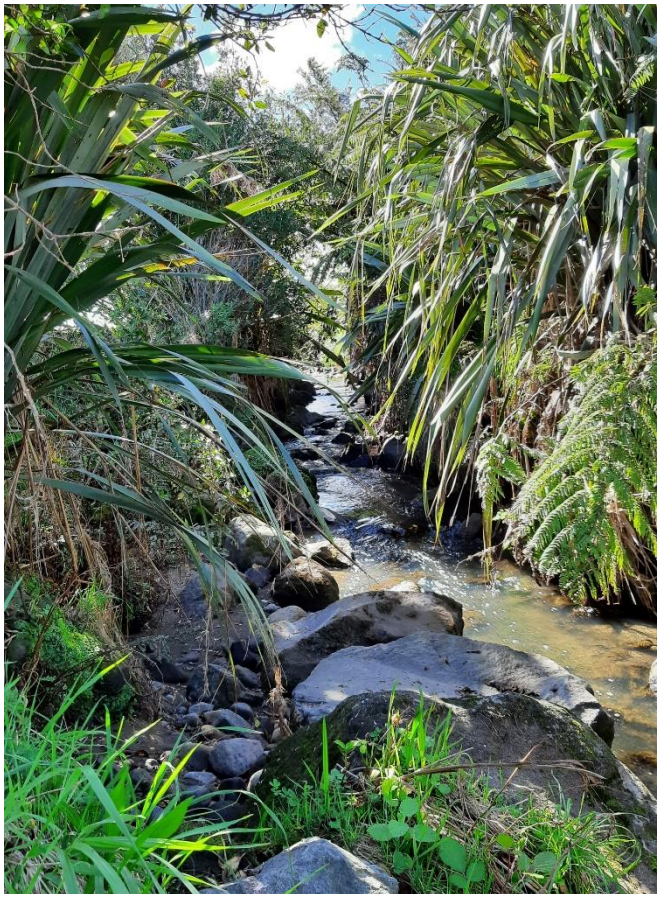

Photo 3 Riparian margin plantings in the Waiteika Stream.

Culverts, dams, weirs and other barriers make it difficult for fish to freely migrate through some catchments in the Volcanic Ring Plain FMU. These barriers will require modification to allow fish passage.

Generally across the FMU, improvement is required to provide for safe contact with freshwater. Presently, more than 80% of rivers and streams are considered unsuitable for swimming and recreation. All 10 swimming sites fail to achieve minimum standards and are, at times, unsuitable for swimming and recreation during the summer bathing season (1 November – 30 March). Cyanobacteria (blue-green algae) blooms occur in Lake Rotomanu at times making this lake unsuitable for human contact. Barrett Lagoon is generally suitable for swimming and recreation.

A summary of the baseline states at each monitoring site is included at Appendix 2 – Baseline states for monitored sites.

How baselines are identified

The Council's approach to compiling baseline information has varied depending on the attribute. Full details are set out in technical memoranda here www.trc.govt.nz.

Where available, monitoring data from water testing or ecological surveys has been used. Monitoring data provides an understanding of what is happening at a particular location. However, using monitoring data alone can introduce site selection bias. This can result in under- or over-representation of rivers and lakes with certain characteristics.

Spatial modelling can help 'fill the gaps' between monitoring sites and present broad-scale patterns in water quality. These models make estimates of water quality or ecosystem health based on the relationships between catchment characteristics such as climate, soils, geology and land use. They can also be used to help us test the impacts of different management approaches, interventions and actions on freshwater outcomes in Taranaki.

Where both monitored and modelled attribute data is available, two methods have been employed to identify baseline state.

- For monitoring site data, each site within an FMU is assigned to a corresponding attribute band.
- For modelled data, a prediction of attribute state is made for each river segment (small geographic units of a river or stream, ranging from 10s to 1,000s of metres in length). The baseline state is identified by determining the total length and overall percentage of total river and stream segments that are assigned to each attribute band.
- For lakes, modelled predictions are made at the scale of the overall lake.

Uncertainty is a component of any freshwater monitoring or modelling. For example, river flows and levels fluctuate throughout the day, and nutrient levels will vary depending on how much rainfall and runoff is occurring. Pathogens and algae will grow in response to a range of factors, such as temperature, light and river flows. This uncertainty is described in terms of 'confidence'. For example, how certain it is that water quality is reflected in the measurement reported. Where possible, additional assessments have been undertaken to determine a level of confidence in the results.

Some of this uncertainty arises because of the design of the monitoring network. The Council is currently undertaking a review of its freshwater state of environment monitoring network to ensure it has adequate coverage across the region and aligns with NPS-FM requirements. Due to the high cost, there will always be limitations to what monitoring alone can achieve.

The Volcanic Ring Plain is our most comprehensively monitored FMU, with more than 50 sites available for the baseline identification process (see Appendix 2 – Baseline states for monitored sites). Over the past two years, the Council has introduced a new lakes monitoring programme, and redesigned the *Can I Swim Here?* summer bathing programme to align with NPS-FM requirements. Monitoring of some aspects of freshwater, such as mahinga kai, threatened species, dissolved oxygen, periphyton and fish require further development.

River water quality

Monitored river water quality results are summarised in (**Table 1**) below.

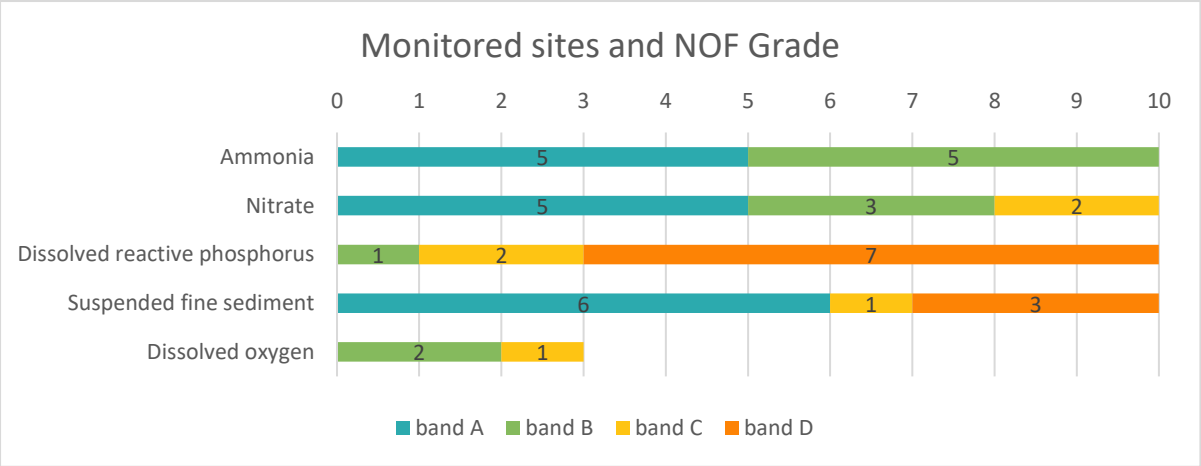

Table 1 Water quality results for monitored sites in the Volcanic Ring Plain FMU.

Nutrients

Ammonia, nitrate and phosphorus are important for plant growth, but in excess amounts can cause problems in freshwater. They can lead to an overabundance of algae and aquatic weeds, impact on the growth of sensitive species, or even become toxic to freshwater organisms.

For ammonia, all 10 monitoring sites fall within bands A and B; above the national bottom line. At these sites, ammonia is likely to have little to no effect on all but the most sensitive species. Modelling estimates indicate that approximately 27% of rivers and streams achieve band A and 73% fall in band B. A very small proportion (less than 0.1%) of rivers and streams fall in band C, below the national bottom line, and may be causing problems for the most sensitive aquatic species (**Figure 4**).

For nitrate, eight out of 10 monitoring sites fall within bands A and B, having little or no effect on the growth of even the most sensitive of species. The remaining two sites are within band C; below the national bottom line. At these sites, the growth of more sensitive species such as fish, may be impaired. Modelling suggests that a very small proportion (<1%) of all rivers and streams have nitrate concentrations within band C. Estimated nitrate concentrations in 69% of the rivers could support nuisance algal growth (band B), if other conditions such as river flows are favourable (**Figure 5**).

Dissolved reactive phosphorus is present in elevated concentrations in rivers and streams, with seven out of 10 monitored sites sitting in band D. Estimates from modelling also place more than 70% of rivers and streams in band D (**Figure 6**). The volcanic soils of the region are a natural source of phosphorus, meaning that it is likely there are both natural sources of phosphorus as well additional inputs arising from human activities.

Suspended fine sediment

Sediment enters rivers and lakes naturally through erosion and runoff, but increases significantly as a result of deforestation, land use activities and direct discharges. Six out of 10 suspended fine sediment monitoring sites fall in band A, meaning there is little to no effect on freshwater health at these sites. There is one site graded in band C and three sites graded in band D. However, modelling estimates a higher proportion of rivers and streams in this FMU that fall below the national bottom line (55% in band D) (**Figure 7**)**.** Further work is required to understand the varying impact and sources of suspended fine sediment across this FMU.

Photo 4 Monitoring of suspended fine sediment by black disk visual clarity.

Dissolved oxygen (DO)

There are three sites in the Volcanic Ring Plain that are monitored for dissolved oxygen. The limited number of sites means there is low confidence that these results are representative of the entire FMU (**Table 1**). It is likely that dissolved oxygen is lower than optimal and that aquatic species are experiencing some stress caused by reduced oxygen dissolve in water.

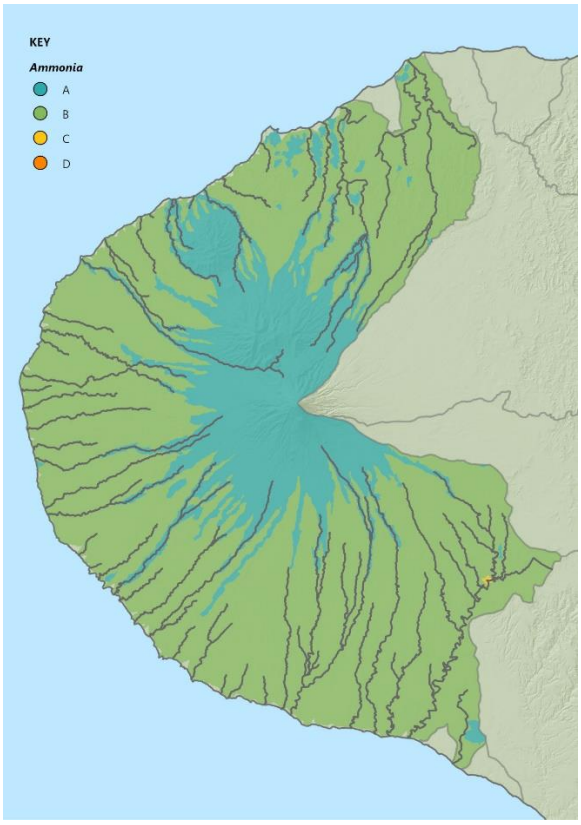

Figure 4 Ammonia modelling.

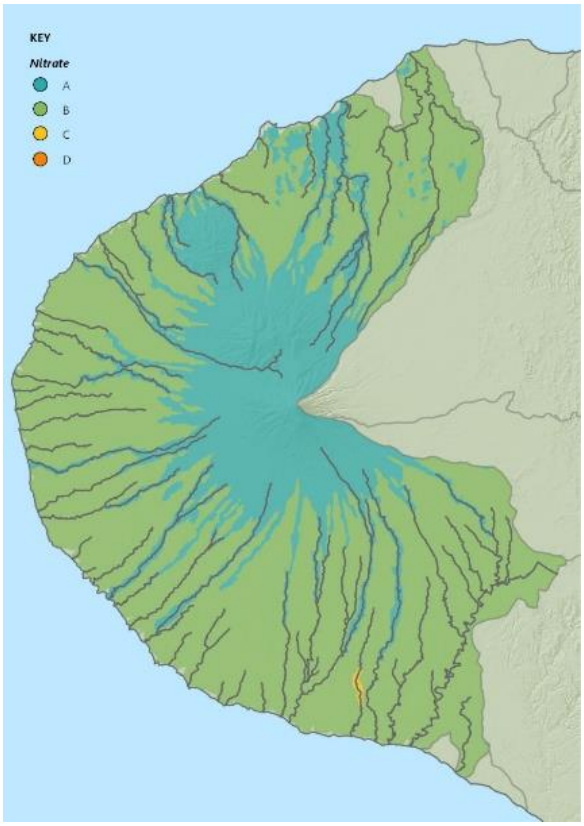

Figure 5 Nitrate modelling

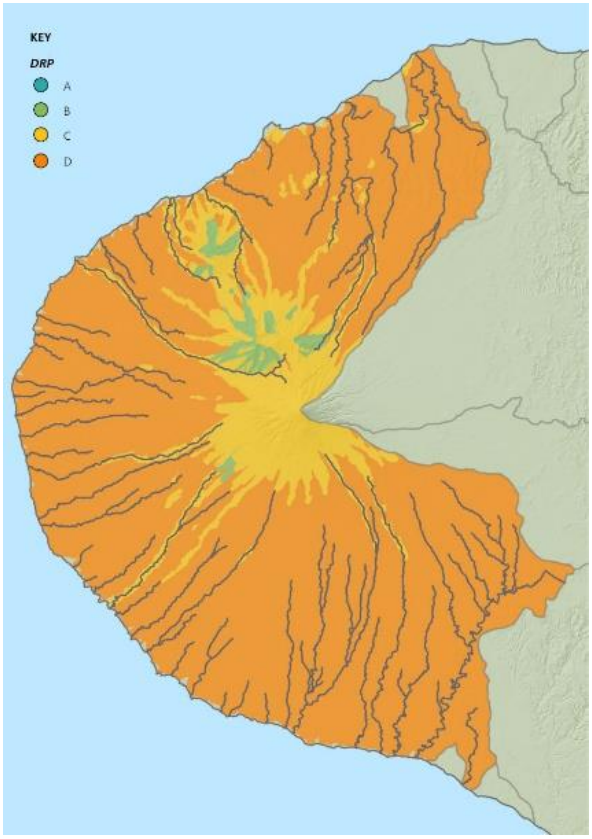

Figure 6 Dissolved reactive phosphorus modelling.

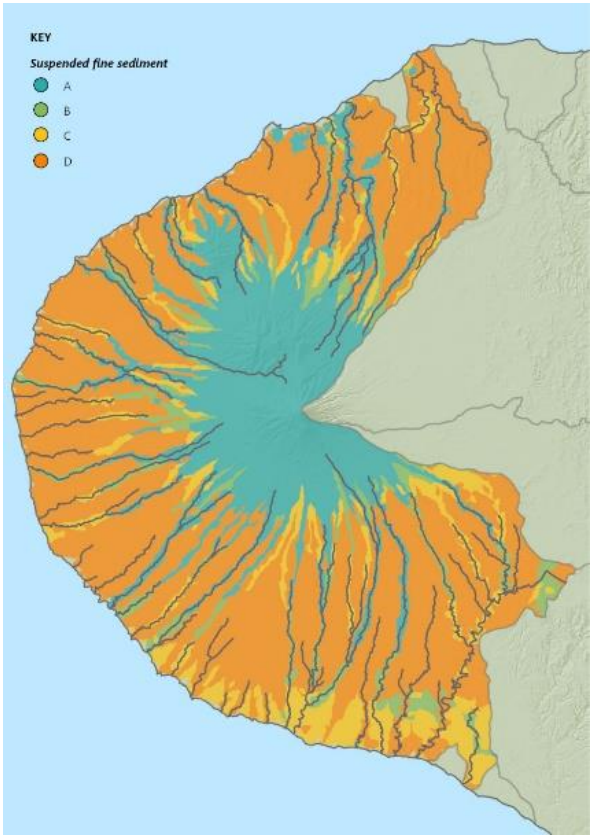

Figure 7 Suspended fine sediment modelling

River water quantity

Water quantity is about tracking how much water is available and how it is being used. This is important for consent holders who might use water for crop irrigation or municipal water supply to enable them to comply with any consent limits. It is also important for ensuring that water allocated for use is done so in a way that provides for other freshwater values, such as ecosystem health.

Under the NPS-FM, water use is managed by setting environmental flows and levels, taking into account any changes that are likely to occur as a result of climate change. Limits can then be set on the rate and amount of water taken, and where and when that water can be abstracted. Monitoring of water use ensures that people comply with the relevant rules and regulations.

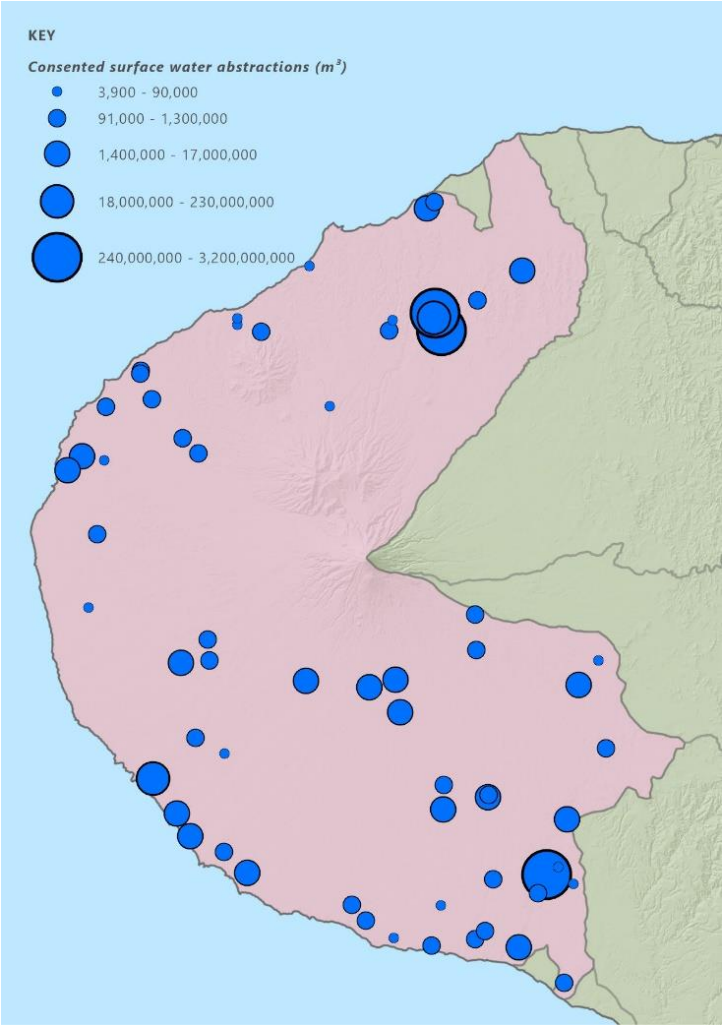

Figure 8 Consented surface water abstraction

The Council's current Regional Freshwater Plan requires that 66% of the mean annual low flow (MALF) be retained as a minimum flow. There is no limit to the amount of water that can be allocated as a proportion of MALF. Currently there are 65 consents to take water in the Volcanic Ring Plain (**Figure 8**). Twenty streams, across 19 catchments in the Volcanic Ring Plain FMU have more than 33% of MALF allocated. Of these consents, 26 currently have no minimum flow limit set.

Setting appropriate environmental flows and levels will be an outcome of the next stage in the NOF process. It is anticipated that more stringent limits will be necessary to provide for other freshwater outcomes such as ecosystem health, mahinga kai and threatened species. This is likely to have implications for the amount of water that can be allocated for use in the future.

River habitat

Ensuring rivers and streams have habitat suitable for supporting aquatic life is essential. The only compulsory attribute is deposited fine sediment. When sediment settles onto the river bed, forming muddy deposits, it can smother the habitats of aquatic organisms that make rivers their home.

Monitoring of deposited fine sediment in accordance with NPS-FM requirements began in June 2023. Due to this limited data record, the Council has repurposed pre-existing information and undertaken modelling.

The available monitoring data indicates that five out of six sites in the Volcanic Ring Plain FMU sit within band B, with one site in band D; below the national bottom line. An existing national spatial model estimates that 40% of rivers and stream sit in band A, nearly 40% are split across bands B and C, and just over 20% fall into band D (Figure 9).

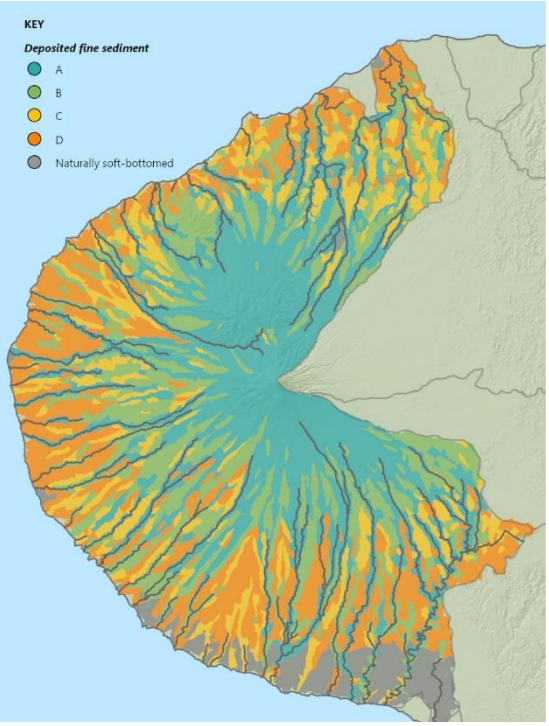

Figure 9 Deposited fine sediment modelling.

River aquatic life

Aquatic organisms are sensitive to changes in water quality, quantity and habitat. By identifying the range of aquatic organisms living in rivers, lakes and streams, and counting their abundance, we can determine the health and wellbeing of freshwater. Some organisms are desirable (indigenous species and others that may be valued for fishing or mahinga kai) where others are undesirable (pest species).

Periphyton

Growth of periphyton generally occurs as a result of nutrient enrichment in combination with favourable conditions such as warm temperatures and low water flows. Two of six monitoring sites fall within band C, whereby periphyton growth may occasionally impact on ecosystem health. The remaining four sites are graded within bands A and B. All sites sit above the national bottom line. It is noted that there is room to improve this monitoring network to ensure it adequately represents the overall FMU.

Photo 5 Aquatic ecosystems state of environment periphyton monitoring at Cape Egmont.

Fish

The fish attribute considers the integrity of fish communities. Within the Volcanic Ring Plain FMU, the health of fish populations is mixed, with two out of four monitored sites showing moderate to high integrity of fish communities and minimal degradation (bands A and B). Two sites sit within band C, where there is a low integrity of the fish community. Interestingly, both of these sites are known to have barriers limiting upstream fish migration. Where barriers prevent fish passage, the connectivity of fish to habitats required for different life stages may be lost or diminished.

Macroinvertebrates

Three measurements are used to assess macroinvertebrate health: macroinvertebrate community index (MCI), quantitative macroinvertebrate community index (QMCI) and macroinvertebrate average score per metric (ASPM).

For MCI, the diversity of macroinvertebrate species is challenged by the environmental conditions in this FMU, with 29 of 39 sites mildly impacted, falling between band B and band D. Two sites have experienced severe pollution or nutrient enrichment with sensitive species largely replaced with those more tolerant of these conditions. These sites fall below the national bottom line and require improvement. This is supported by the modelling, which estimates that the majority of rivers and streams (around 85%) experience mild to moderate pollution and nutrient enrichment, with a small percentage below the national bottom line (approximately 2%) (**Figure 10**).

For QMCI, 16 of 39 sites fall into band A, indicating that water is pristine with almost no pollution. Three sites fall into band B, and eight sites fall into band C. Twelve sites fall into band D and are below the national bottom line and require improvement. Sites achieving band A are generally close to Te Papa-Kura-o-Taranaki. The decrease in health in a downstream direction is likely influenced by cumulative land use impacts, such as increased nutrients and decreased shading. Modelled data suggests that macroinvertebrate communities are experiencing less severe organic pollution than monitoring indicates, with only 2% of river and stream habitat estimated to be below the national bottom line for QMCI (**Figure 11**).

For APSM, 30 out of 39 sites are mildly to moderately polluted or enriched (bands B and C), while the remaining nine sites are pristine (band A) with almost no pollution or enrichment. No sites indicate macroinvertebrate communities are affected by severe pollution or enrichment and all monitored sites achieve above the national bottom line. Modelling however, suggests that effects on macroinvertebrate communities could be more widespread, estimating less than 8% of rivers and streams in the Volcanic Ring Plain FMU to be in pristine condition, 88% mild to moderately impacted, and 4% falling in band D below the national bottom line (**Figure 12**).

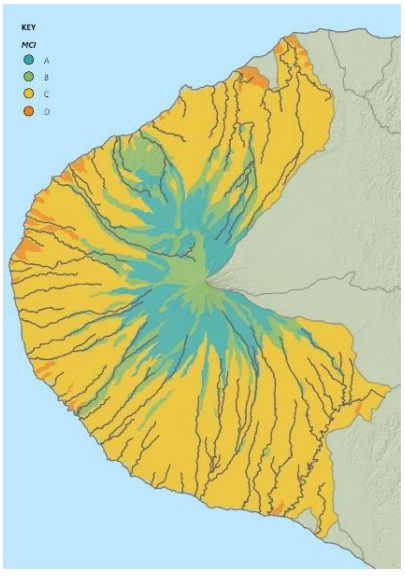

Figure 10 MCI modelling.

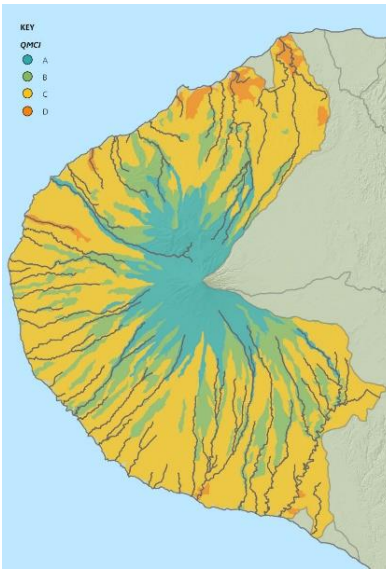

Figure 11 QMCI modelling.

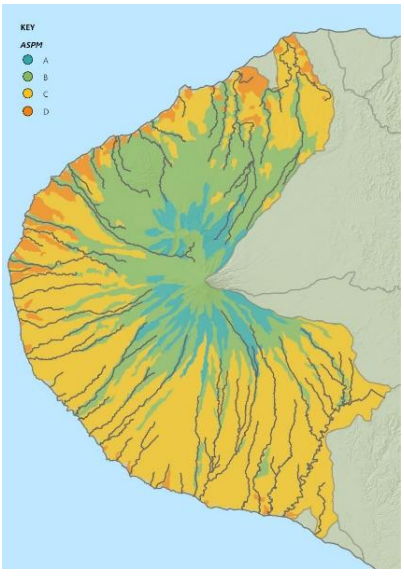

Figure 12 ASPM modelling.

Photo 6 The extent to which macroinvertebrates, like this mayfly *Coloburiscus*, are present is an indicator of waterway health.

Ecological processes

Ecological processes are assessed by looking at ecosystem metabolism. This is derived from at least seven days of continuous dissolved oxygen monitoring collected during summer (1 November to 30 April). There is currently limited data and modelling to inform baseline state and a new monitoring programme is required. This will be possible as the Council rolls out its dissolved oxygen monitoring network to align with NPS-FM requirements over the next couple of years. To date, the Council has established three sites with continuous monitoring of dissolved oxygen in the Volcanic Ring Plain FMU.

Ecosystem health in lakes

The health of lake ecosystems is affected by nutrients, sediment and other pollutants, just as it is in rivers and streams. However, lakes behave differently to rivers and streams due to being more confined environments, relatively still/slow flowing and having greater depths. Lakes provide important habitat for indigenous plants and animals and can be susceptible to the growth of pest vegetation, so some additional attributes are also included.

There is only one lake monitored in the Volcanic Ring Plain FMU: Barrett Lagoon. Regular monitoring at Barrett Lagoon began in April 2023, with the short lifespan of monitoring making it difficult to grade the environmental health of the lake. Modelling (**Table 2**) indicates that nitrogen and dissolved oxygen fall into band D, below the national bottom line and requiring improvement. Total phosphorous and phytoplankton fall into band C and ammonia is graded band B. As a shallow lake, Barrett Lagoon is unlikely to become seasonally stratified and the mid-hypolimnetic dissolved oxygen attribute is not applicable.

As in rivers, aquatic life in lakes is strongly linked to water quality. The measures of aquatic life in lakes are phytoplankton (algae) and native and invasive submerged plants. Modelling suggests that Barrett Lagoon is graded in the C band for phytoplankton, meaning that aquatic life in Barrett Lagoon is being impacted by the additional algal growth caused by elevated nutrient levels. The Council has not yet undertaken monitoring for submerged plants in the Volcanic Ring Plain FMU.

Barrett Lagoon attribute grades					
Attribute	**D band**	**C band**	**B band**	**A band**	**N/A**
Total nitrogen	✓				
Total phosphorus		✓			
Ammonia			✓		
Lake-bottom DO	✓				
Mid-hypolimnetic DO					✓
Phytoplankton		✓			

Table 2 Modelled results for ecosystem health of Barrett Lagoon. The grey lines indicate national bottom lines set out in the NPS-FM for lakes.

Human contact

Escherichia coli – routine

Grading of *E. coli* (**Figure 13**) for year-round monitoring is different to other NOF attributes. A fifth band, E, is included and there is no national bottom line, although band C and above is generally considered to be the minimum standard for primary contact.

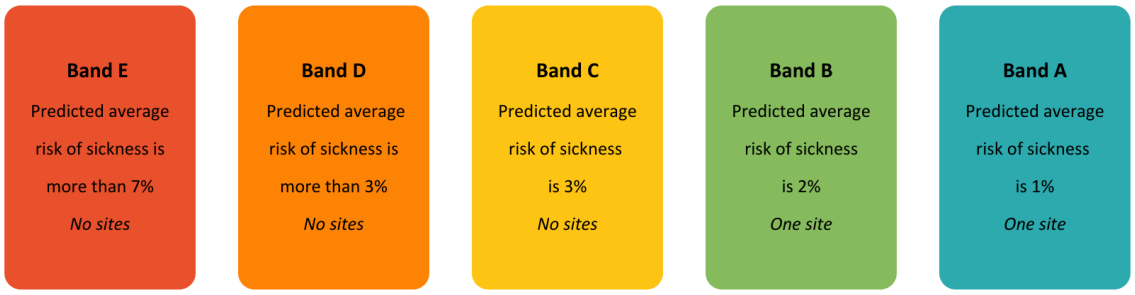

Figure 13 Grading of *E. coli* for routine monitoring which includes an additional 'band E' not included in other NOF attributes.

The routine monitoring of *E. coli* is carried out every month at 10 sites as part of the Council's state of environment water quality monitoring. One site is graded band A, one site band C, three sites band D and the remaining five sites are band E (**Figure 13**). Barrett Lagoon is the only lake that is monitored for *E. coli* year-round, with monthly monitoring commencing at the start of 2023. Preliminary results indicate that overall lake water quality is suitable for swimming however, further monitoring is required to fully assess this site. Monitoring site baseline states are considered broadly representative of the rivers and streams found throughout the Volcanic Ring Plain FMU. This is supported by spatial water quality modelling which suggests more than 80% of the region's rivers and streams are currently unsuitable for swimming or recreation and fall within bands D or E (**Figure 14**). All waterways below band A require improvement under the NPS-FM.

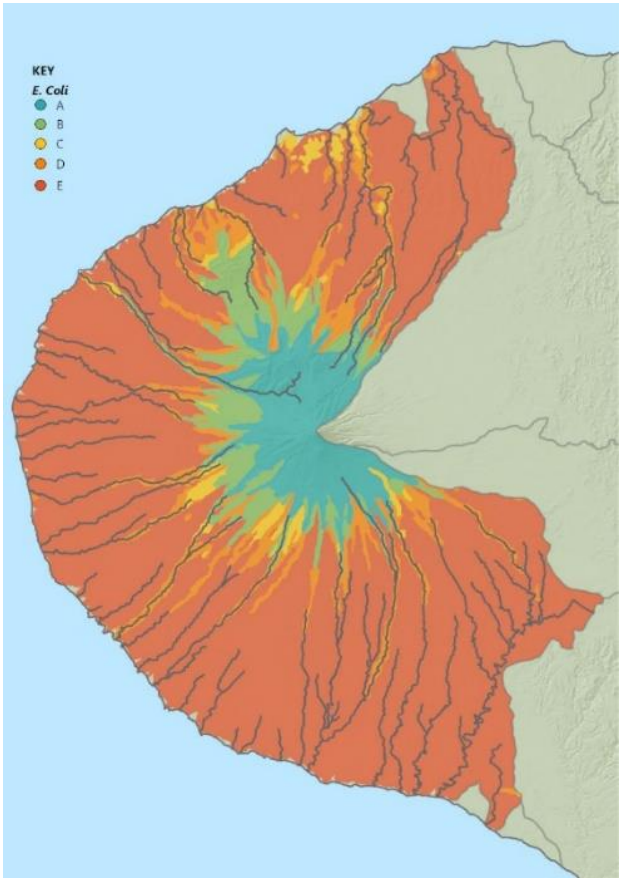

Figure 14 *E. coli* modelling.

There is a clear pattern of degradation in water quality with distance from Te Papa-Kura-o-Taranaki. This degradation generally reflects the increasing cumulative impacts of intensive agriculture, urban stormwater and wastewater discharges as water makes its way downstream through the catchment.

***Escherichia coli* (primary contact sites)**

In addition to the routine monitoring of *E. coli*, the Council undertakes additional weekly monitoring of primary contact sites to identify potential health risks during the summer bathing season. Primary contact sites in the Volcanic Ring Plain FMU are located in popular swim spots on nine rivers and one lake[1]. Results are based on the risk of getting sick when people go for a swim (**Figure 15**).

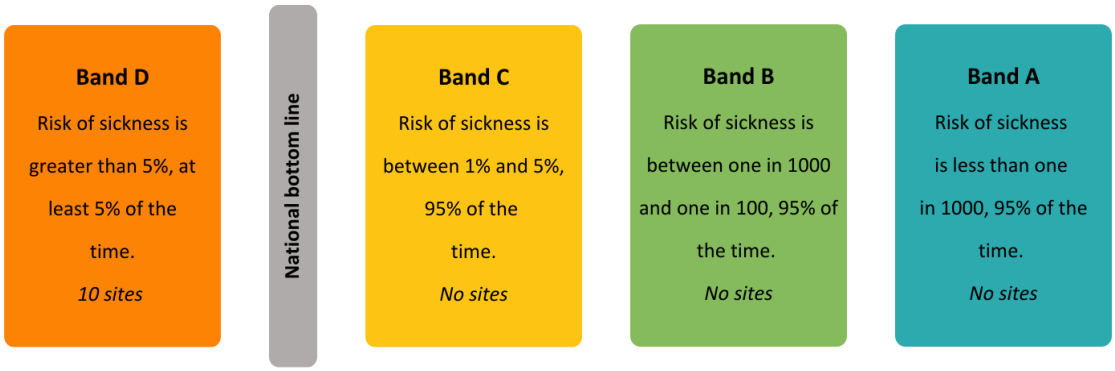

Figure 15 Grading of *E.coli* for primary contact sites

All 10 sites within the Volcanic Ring Plain FMU are currently graded in band D, and are therefore considered unsuitable for swimming under the NPS-FM.

Photo 7 The ability to swim in our rivers is a value that is important to the community.

[1] Primary contact sites in the Volcanic Ring Plain FMU are: Kaupokonui Stream at mouth, Lake Rotomanu, Oakura River at mouth, Te Henui Stream at mouth, Timaru Stream at mouth, Waingongoro River at mouth, Waingongoro at Taumata Park, Waiwhakaiho River at Meeting of Waters, Waiwhakaiho River at Merrilands Domain and Waiwhakaiho River at mouth.

Cyanobacteria

Cyanobacteria, otherwise known as blue-green algae, is monitored at Lake Rotomanu and Barrett Lagoon. Regular monitoring at Barrett Lagoon only began in April 2023, so there is limited information to assess the impact of cyanobacteria on human contact. Instead, the Council has used modelling along with measured data. This determines that Barrett Lagoon is likely to sit within band A, meaning that the risk exposure is no different to that in natural conditions.

Lake Rotomanu is graded band D for cyanobacteria, indicating there have been high health risks associated with freshwater contact; though results appear to have improved in the last couple of years. Long-term monitoring has identified sporadic algal blooms in this lake, typically during summer months. Drivers include warm temperatures and excess nutrients.

Te Mana o te Wai

Te Mana o te Wai is the central concept underpinning the NPS-FM 2020 and refers to the fundamental importance of water and the connection all New Zealanders have with it. It recognises that protecting the health of freshwater protects the health and well-being of the wider environment and the community. It recognises the relationship that tangata whenua have with wai (water) through whakapapa (familial relationship through heritage).

There are six principles of Te Mana o Te Wai which identify the responsibilities that apply to different people. These principles are:

mana whakahaere: the power, authority, and obligations of tangata whenua to make decisions that maintain, protect, and sustain the health and well-being of, and their relationship with, freshwater.

governance: the responsibility of those with authority for making decisions about freshwater to do so in a way that prioritises the health and well-being of freshwater now and into the future.

kaitiakitanga: the obligation of tangata whenua to preserve, restore, enhance, and sustainably use freshwater for the benefit of present and future generations.

stewardship: the obligation of all New Zealanders to manage freshwater in a way that ensures it sustains present and future generations.

manaakitanga: the process by which tangata whenua show respect, generosity, and care for freshwater and for others.

care and respect: the responsibility of all New Zealanders to care for freshwater in providing for the health of the nation.

There is a hierarchy of obligations under Te Mana o te Wai which sets out the decision making priorities for freshwater management. The hierarchy prioritises:

- first, the health and well-being of waterbodies and freshwater ecosystems;
- second, the health needs of people (such as drinking water); and
- third, the ability of people and communities to provide for their social, economic and cultural well-being now and in the future.

This hierarchy recognises that all freshwater needs and uses are reliant upon healthy water for their long-term provision.

Every regional council must include an objective in its regional policy statement that describes how the management of freshwater in their region will give effect to Te Mana o te Wai

Ngā Iwi o Taranaki provided a first draft of a Te Mana o te Wai objective that reflected how tangata whenua see the concept being given effect to. The Council has prepared a second draft which springs from that. Following this consultative stage, and considering the feedback received, further work and refinements will be made to the draft objective in collaboration with Ngā Iwi o Taranaki. To support this objective, a broader policy framework will also be prepared to ensure that Te Mana o te Wai is given effect to through the different management and decision making processes of the Regional Freshwater Plan.

The draft Te Mana o te Wai objective that the Council is seeking feedback on is included in the box that follows:

Objective – Te Mana o Te Wai

Through partnership with tangata whenua and the community, Te Mana o te Wai will be given effect to by:

a) *recognising and providing for the mana motuhake, manaakitanga and kaitiakitanga of tangata whenua partners in management and decision making on freshwater;*
b) *strengthening the relationships between wai (water), whenua (land) and all people and, for tangata whenua o Taranaki, affirming and strengthening the enduring, integral whakapapa relationships;*
c) *upholding, protecting, and restoring the mauri, health, and well-being of wai and waterbodies for current and future generations;*
d) *acknowledging and responding to the unique whakapapa of waterbodies; and*
e) *providing for waterbodies to behave [naturally] as they wish;*

so that the interconnectedness of wai, whenua and taiao continue to support and perpetuate life.

QUESTIONS TO PONDER

TE MANA O TE WAI

Question 1: What do you think about the objective of giving effect to Te Mana o te Wai?

Question 2: Do these provisions cover everything that is important to you? Please let us know if there is anything missing.

Question 3: Tell us to what extent you agree or disagree with these draft provisions in the objective.

Long-term vision for the Volcanic Ring Plain FMU

A long-term vision is an objective that sits within the Regional Policy Statement (RPS) that reflects the aspirations of the Council, tangata whenua and the broader community for freshwater within the FMU. The purpose of that objective is to set out an ambitious *but* reasonable goal for the FMU, and to illustrate what freshwater would look like in the long term.

The long-term vision itself identifies the timeframe within which the objective is to be achieved, and the very nature of this is to be beyond the life of the RPS. This approach encourages the Council to anticipate and strategically plan for continuous and sustained improvements across a much longer planning horizon and to confirm the practicality of the vision.

The broader NOF framework and other directions in the NPS-FM set out the process for turning this ambitious long-term vision into something that can be implemented and achieved. It does this through the development of environmental outcomes, setting of target attributes, setting limits on freshwater use, applying conditions to resource consents, developing action plans and reviewing the freshwater rules and broader policy framework. This is a much broader process that will take more time and collaboration with stakeholders and tangata whenua to work through.

What is below is a starting point for those discussions to spring from. The draft below has sprung from and has been informed by position papers from tangata whenua, feedback from previous consultation and Council knowledge.

You may notice that the date to achieve the long term visions is yet to be determined. This timeframe will be part of the conversations taking place in early 2024

Long-term vision for the Volcanic Ring Plain Freshwater Management Unit

In the Volcanic Ring Plain Freshwater Management Unit:

1. *freshwater and the effects of activities on freshwater are managed to give effect to te Mana o te Wai;*
2. *the journey of freshwater, from numerous springs on Taranaki Maunga and the broader volcanic apron down through coastal cliffs and estuaries to the Tasman Sea, sustain the life force and mauri of the environment and reflect their natural variability and natural form and character;*
3. *the waters of Te Papa-Kura-o-Taranaki (the national park) and Conservation Lands are protected and celebrated as waters which behave in accordance with their natural character;*
4. *water bodies, including riparian margins, wetlands and lakes, groundwater and surrounding habitats, support diverse, abundant and connected ecosystems and the resilience of indigenous and threatened species;*
5. *the mana of tangata whenua and their traditional and ongoing relationships with wai are restored through mahinga kai and the practice of mātauranga Māori;*
6. *land use and freshwater practices improve freshwater quality so that ecosystem health and human health needs are provided for and protected by:*
    a. *taking into account historical cumulative effects of intensive land use on the environment; and*
    b. *being responsive to the current and future effects of climate change;*
7. *strong and resilient biodiversity provide for the sustainable harvest of mahinga kai, rongoa and fish; and*
8. *water bodies, in particular primary contact sites, are safe for swimming, mahinga kai and other customary and recreational purposes;*

by the year (date tbc).

QUESTIONS TO PONDER LONG TERM VISIONS

Question 4: What do you think about the draft long-term visions for the Volcanic Ring Plain FMU?

Question 5: To what extent do you agree or disagree with the draft long-term visions?

Values and environmental outcomes for the Volcanic Ring Plain FMU

The NPS-FM uses the term "values" to refer to important aspects of freshwater that need to be considered and provided for when setting targets and limits. Freshwater must be managed to protect compulsory freshwater values and other values present within the FMU. Compulsory values are those required to be addressed through the NOF: ecosystem health, human contact, threatened species and mahinga kai. Non-compulsory values must be considered, and, if relevant to the FMU, taken through the NOF process.

For any value identified within an FMU, the Regional Freshwater Plan must set out an objective (environmental outcome) which describes the desired state for water bodies in that FMU. Because environmental outcomes are included in the Regional Freshwater Plan, they therefore have a strong association with the policies, rules and consenting processes relating to freshwater management decisions.

The identification of values and the draft environmental outcomes for the Volcanic Ring Plain FMU has been informed by position papers from tangata whenua, previous consultation and Council knowledge.

Compulsory values

Ecosystem health

Environmental conditions ensure that ecosystems within the Volcanic Ring Plain FMU are healthy and resilient to seasonal variations, the impacts of climate change and the effects of land and freshwater use by achieving the following:

a) ***Water Quality:*** *the physical and chemical measures of freshwater including appropriate light penetration and nutrient and oxygen concentrations ensure the healthy functioning of ecosystems;*
b) ***Water Quantity:*** *the extent and variability in the level and flow of freshwater:*
    i. *maintains the hydrological connectivity;*
    ii. *maintains and improves aquatic habitats;*
    iii. *provides for life stages of aquatic biodiversity;*
    iv. *supports terrestrial habitats; and*
    v. *ensures appropriate nutrient cycling;*
c) ***Habitat:*** *the natural and physical form, structure and extent of water bodies are protected and improved from their current state to ensure the preservation of aquatic habitats and indigenous aquatic ecosystems;*
d) ***Aquatic Life:*** *healthy communities of microbes, invertebrates, plants and fish are found throughout and identified pest species are managed to reduce their impact on aquatic life;*
e) ***Ecological Processes:*** *the well-functioning interactions between water bodies (hydrology and physical-chemical characteristics), their surrounding environments (landscapes, geology and climate) and their biota are recognised and provided for.*

Human contact

Human connections to water bodies are provided for, by:

a) *facilitating opportunities for safe contact at primary contact sites (refer Appendix 3 – Identified values in the Volcanic Ring Plain FMU [Primary contact sites]), particularly in summer; and*
b) *reducing the overall risk to human health throughout the Volcanic Ring Plain FMU.*

Threatened species

*Wetlands, riparian margins and other critical habitats within the Volcanic Ring Plain FMU promote the continued survival, natural migration and long-term recovery of threatened species (refer **Appendix 3 – Identified values in the Volcanic Ring Plain FMU [Freshwater dependent threatened species]**).*

Mahinga kai

Tangata whenua can safely practise mahinga kai, and sustainably harvest and consume species important to them for whānau and marae events, year-round within the Volcanic Ring Plain FMU because:

a. *kaitiakitanga is exercised by tangata whenua according to their tikanga and customs, including while carrying out mahinga kai activities and practices;*
b. *waterways support a healthy, diverse and abundant range of mahinga kai species;*
c. *mahinga kai species can travel naturally throughout the catchments to complete necessary life stages;*
d. *habitat of mahinga kai species is thriving and flourishing (healthy and improving);*
e. *water quality and water quantity support healthy mahinga kai species and areas; and*
f. *whānau (all generations) can safely access mahinga kai sites, areas and waterbodies, and share knowledge and customs associated with mahinga kai.*

Non-compulsory values

Natural form and character

The natural form and character of water bodies within the Volcanic Ring Plain FMU are protected and, where the natural form and character has been degraded, their restoration is promoted and provided for.

Drinking water supply

Sustainable and potable drinking water is provided for throughout the Volcanic Ring Plain FMU by sufficient freshwater quality and quantity and is palatable where the natural chemistry of the source allows.

Wai tapu

Tangata whenua can access wai tapu sites and localities within the Volcanic Ring Plain FMU which are free from human and animal waste, contaminants and excess sediment; the valued features and unique properties of wai are protected.

Watercraft and tauranga waka

Catchments/reaches of the Volcanic Ring Plain FMU that are important for watercraft and tauranga waka (refer Appendix 3 – Identified values in the Volcanic Ring Plain FMU [Watercraft and Tauranga waka sites]) have sufficient freshwater quantity to be navigable.

Fishing

The health and abundance of fisheries species within the Volcanic Ring Plain FMU are provided for by suitable freshwater quality and quantity including at identified recreational fishing areas (refer Appendix 3 – Identified values in the Volcanic Ring Plain FMU [Fishing values]).

Hydro-electric power generation

[The Council has not identified this as a value for the Volcanic Ring Plain FMU. If you think this value does apply, please provide feedback, including rationale and which catchment(s)/part of catchment(s) you think this value applies to.]
Animal drinking water *Water bodies within the Volcanic Ring Plain FMU provide sufficient and safe water for the drinking needs of animals.*
Irrigation, Cultivation, and Production of Food and Beverages *Irrigation, cultivation and the production of food and vegetables within the Volcanic Ring Plain FMU are sustainably provided for by suitable and reliable freshwater quality and quantity.*
Commercial and industrial use *Commercial and industrial activities and opportunities within the Volcanic Ring Plain FMU are sustainably provided for by suitable and reliable freshwater quality and quantity.*

QUESTIONS TO PONDER VALUES AND OUTCOMES

Question 6: Have the right values been identified for the Volcanic Ring Plain FMU?

Question 7: What do you think of the draft environmental outcomes identified for each value in the Volcanic Ring Plain FMU?

For example, the value for fishing has the environmental outcome of "*The health and abundance of fisheries species within the Volcanic Ring Plain FMU are provided for by suitable freshwater quality and quantity including at identified recreational fishing areas*"

Progressing towards identifying target attribute states

Progress towards achieving each of the environmental outcomes will be measured by identification of target attribute states. The target attribute states set out the milestones and overall goal for each attribute to support the achievement of the relevant environmental outcomes and long-term visions. A target attribute state must not be lower than the baseline state and must at least achieve national bottom lines. For attributes associated with the value of human contact, the target state must be higher than the baseline to deliver on national targets for improving swimmability.

Further work with tangata whenua, communities and stakeholders is required to identify possible mitigations and actions, and set target attribute states that are both ambitious and achievable. In doing so, the Council will need to identify the 'gap' between the current/baseline state and these targets, and consider the options and opportunities over the next years and decades to close that gap. These opportunities include updating rules and policies in the Regional Freshwater Plan where activities are having a detrimental effect on the environment, preparing action plans (non-regulatory approaches) to making improvements and updating consent conditions.

Set out below are a set of draft principles to guide the setting of target attribute states.

Principles for setting target attribute states

1. All assessments of target attribute state must have regard to the foreseeable impacts of climate change.
2. All target attribute states must either maintain or improve the attribute state from baseline:
   a) to meet or exceed national bottom lines (except in the case of naturally occurring processes); and
   b) to either:
      i. maintain the baseline state where the relevant environmental outcome(s) is already being achieved (including clause 2(a)); or
      ii. improve upon the baseline state where this is not considered to achieve the relevant environmental outcome(s).
3. When identifying and assessing target attribute states, identify all actions/approaches/ mitigations that would be required to achieve improvements at each NOF band.
4. Using best available information, ensure that an identified target attribute state is achievable within the timeframe set in the long-term vision. Where the timeframe of a draft long-term vision may be unreasonable or unachievable, identify alternative options to inform the draft long-term vision.
5. Where an attribute state is unlikely to meet the vision and environmental outcomes within 10 years, or where significant short-term gain can be achieved, support the target attribute state with interim targets (no more than 10-year timeframes).

QUESTIONS TO PONDER TARGET ATTRIBUTE STATES

Question 8: What do you think of the principles for setting target attribute states?

Question 9: What is important for the Council to consider when setting target attribute states for the Volcanic Ring Plain FMU?

Glossary

Biological diversity means the variability among living organisms, and the ecological complexes of which they are a part, including diversity within species, between species, and of ecosystems.	RMA
Ecosystem means the complexes of organisms and their associated physical environment within an area (and comprise: a biotic complex, an abiotic environment or complex, the interactions between the biotic and abiotic complexes, and a physical space in which these operate).	NPS-IB
Freshwater or **fresh water** means all water except coastal water and geothermal water.	RMA
Indigenous biodiversity means the living organisms that occur naturally in New Zealand, and the ecological complexes of which they are part, including all forms of indigenous flora, fauna and fungi, and their habitats.	NPS-IB
Natural form and character has the same meaning as in Appendix 1B of the NPS-FM, which refers to: matters contributing to the natural form and character of an FMU are its biological, visual and physical characteristics that are valued by the community, including: (a) its biophysical, ecological, geological, geomorphological and morphological aspects (b) the natural movement of water and sediment including hydrological and fluvial processes (c) the natural location of a water body and course of a river (d) the relative dominance of indigenous flora and fauna (e) the presence of culturally significant species (f) the colour of the water (g) the clarity of the water.	NPS-FM App 1B
Resilience in relation to an ecosystem, means the ability of the ecosystem to recover from and absorb disturbances, and its capacity to reorganise into similar ecosystems [Resilient has the same meaning].	NPS-IB
Restoration means the active intervention and management of modified or degraded habitats, ecosystems, landforms and landscapes in order to maintain or reinstate indigenous natural character, ecological and physical processes, and cultural and visual qualities, and may include enhancement activities. [Restore has the same meaning].	NPS-IB
Te Mana o te Wai has the same meaning as set out in clause 1.3 of the NPS-FM.	NPS-FM
Water: a) means water in all its physical forms whether flowing or not and whether over or under the ground: b) includes freshwater, coastal water, and geothermal water: c) does not include water in any form while in any pipe, tank, or cistern	RMA
Water bodies means freshwater or geothermal water in a river, lake, stream, pond, wetland, or aquifer, or any part thereof, that is not located within the coastal marine area.	RMA

Appendix 1 – NOF attribute descriptions

Rivers

	NOF Attribute	Applies to	Description
Water quality	Ammonia (toxicity)	Rivers and lakes	Ammonia and nitrate are two forms of nitrogen; an essential nutrient for plant growth. They are components of nitrogen-based fertilisers which enter the environment from point source discharges and runoff. Ammonia and nitrate contribute to the rapid growth of aquatic weeds and at certain levels are toxic to aquatic life.
	Nitrate (toxicity)	Rivers	
	Dissolved reactive phosphorus (DRP)	Rivers	A form of phosphorus that is available for plants to use for growth. High levels of DRP can contribute to periphyton (green-brown algae) growth in rivers.
	Suspended fine sediment	Rivers	Fine particles of sediment from erosion, runoff, and effluent discharges reduce light penetration and smother habitat. Too much fine sediment can make rivers and streams unpleasant to swim in and unsuitable for drinking water and for mahinga kai.
	Dissolved oxygen	Rivers	Dissolved oxygen is required by all aquatic life for respiration. The availability of oxygen dissolved in water will decrease as nutrients, temperature and algal growth increases. If the amount of oxygen dissolved into water drops below a certain point, it can lead to stress, harm or death of aquatic life.
	Dissolved oxygen	Rivers (below point sources only)	Oxygen dissolved in water can be directly affected by a point-source discharge such as a pipe at a factory or wastewater facility. The nutrients and organic matter in wastewater discharges can lead to increased microbial growth in aquatic environments, which can subsequently deplete dissolved oxygen concentrations.
Physical habitat	Deposited fine sediment	Wadeable rivers	Deposited fine sediment is mud, silt or sand that has been accumulated onto the river bed. When sediment is deposited, it fills spaces between rocks and reduces the available habitat for freshwater organisms.
Aquatic life	Periphyton (trophic state)	Rivers	Periphyton is the green-brown algae that grows on the rocks and on the river bed. Growth of periphyton is affected by temperature and nutrients in the water. When rivers rise with rain, periphyton is washed away but during low flows excess periphyton growth can cause issues for freshwater ecosystems, drinking water and for recreation.
	Fish (rivers)	Rivers	Fish habitat can be impacted by deposited sediment or excess algal growth, making it difficult for fish to survive and spawn. Many native fish also migrate, travelling the lengths of the rivers from which they spawn. The presence or absence of fish species in waterbodies is representative of fish community health. Reduced fish community health

			may be indicative of reduced ecosystem health generally or other factors such as barriers preventing fish from moving through a catchment.
	Macroinvertebrates (1 of 2) – MCI & QMCI	Rivers	Macroinvertebrates are small animals such as aquatic worms, insects and snails. Their sensitivity to environmental changes makes them a good indicator of stream health. MCI simply accounts for the presence of a particular species, whereas QMCI also includes the number of individuals present.
	Macroinvertebrates (2 of 2) - ASPM	Rivers	The ASPM measure of macroinvertebrates combines both MCI and QMCI, and also counts of three particularly sensitive, closely related, families of insects.
Ecosystem processes	Ecosystem metabolism	Rivers	The cycling of energy, nutrients, carbon and oxygen through the food chain provides the appropriate balance to support organisms from plants and algae through to fish and birds.

Lakes

	NOF Attribute	**Applies to**	**Description**
Water quality	Total nitrogen (trophic state)	Lakes	Total nitrogen is a measure of the availability of all forms of nitrogen in lakes, including ammonia and nitrate. Nitrogen is an essential nutrient for aquatic plants however, elevated nitrogen can contribute to excessive lake plant and algal growth and degrade ecological communities.
	Total phosphorus (trophic state)	Lakes	Total phosphorus is a measure of all the available forms of phosphorus in lakes, including DRP. Like nitrogen, phosphorus is an essential nutrient for plant growth, but it can accumulate with sediment at the bottom of a lake where it can be released periodically when dissolved oxygen concentrations are depleted, helping drive lake algal blooms.
	Ammonia (toxicity)	Rivers and lakes	Ammonia contributes to the rapid growth of aquatic weeds and at certain levels is toxic to aquatic life.
	Lake-bottom dissolved oxygen	Lakes	This relates to the levels of dissolved oxygen on the bottom of lakes which is important for aquatic organisms inhabiting these areas. The availability of oxygen dissolved in water will decrease as nutrients, temperature and algal growth increases. If the amount of oxygen dissolved into water drops below a certain point, it can lead to stress, harm or death of aquatic life.

	Mid-hypolimnetic dissolved oxygen	Seasonally stratified lakes	This relates to the levels of dissolved oxygen in the lower parts of seasonally stratifying lakes, where fish are most likely to reside due to more conducive temperatures. The availability of oxygen dissolved in water will decrease as nutrients, temperature and algal growth increases. If the amount of oxygen dissolved into water drops below a certain point, it can lead to stress, harm or death of aquatic life.
Aquatic life	Phytoplankton (trophic state)	Lakes	Phytoplankton are microscopic organisms that float freely near the surface of lakes. In high numbers, phytoplankton are seen as algal blooms.
	Submerged plants (native)	Lakes	Native submerged plant species are an important part of the freshwater ecosystem, providing food and habitat for fish and other aquatic animals. Plants also help to improve water quality by filtering pollutants and sediments.
	Submerged plants (invasive)	Lakes	Invasive submerged plant species can disrupt freshwater ecosystems by displacing native plant species and can have negative impacts on lake ecosystems.

Human contact

Attribute	**Applies to**	**Description**
Escherichia coli	Lakes and rivers	*Escherichia coli* (*E. coli*) is used to indicate faecal contamination in freshwater which create risks for human health in elevated concentrations. Contamination might come from wastewater, industry and animal effluent discharges.
Escherichia coli (primary contact sites)	Primary contact sites in lakes and rivers (during the bathing season)	Popular swimming and recreational spots have been identified as primary contact sites which are monitored over the summer period. *E. coli* measures are graded against recommendations from the World Health Organisation on safe recreational water quality. These grades provide a level of risk for getting sick.
Cyanobacteria (planktonic)	Lakes and lake-fed rivers	Blue-green algae, or cyanobacteria, live naturally in freshwater. Blue-green algae can become problematic when excess nutrients and elevated water temperatures allow them to grow excessively, resulting in algal blooms. These can be seen as bright green or blue-green globules in the water column or as surface scums that can accumulate at lake edges. Some species of cyanobacteria produce toxins which can present health risks to people and animals.

Appendix 2 – Baseline states for monitored sites

Site code	Site name	Periphyton (trophic state)	Ammonia (toxicity)	Nitrate (toxicity)	Suspended fine sediment	*E. coli* (regional sites)	Fish-IBI	Macroinvertebrates SQMCI	Macroinvertebrates MCI	Macroinvertebrates ASPM	Deposited fine sediment	Dissolved oxygen (rivers)	Dissolved reactive phophorous	*E. coli* (primary contact sites)	Phytoplankton (lakes)	Total nitrogen (lakes)	Total phosphorus (lakes)	Cyanobacteria (lakes)	Submerged plants (natives)	Submerged plants (invasive species)	Lake-bottom dissolved oxygen	Mid-hypolimnetic dissolved oxygen
Rivers																						
HRK000085	Herekawe Stream upstream of Centennial Drive							D	C	C				N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
HTK000350	Huatoki Stream at end of Hadley Road							A	C	B				N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
HTK000425	Huatoki Stream at Huatoki Domain entrance							A	B	B				N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
HTK000745	Huatoki Stream at Molesworth Street							D	D	C				N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
KPA000230	Kapoaiaia Stream 1.3km upstream of Wiremu Road						C							N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
KPA000250	Kapoaiaia Stream at Wiremu Road							A	A	A				N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
KPA000700	Kapoaiaia Stream at Wataroa Road Bridge							C	C	B				N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
KPA000950	Kapoaiaia Stream at the coast	B	A	A	A	E		D	D	C	A	B	D	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
KPK000250	Kaupokonui River at Opunake Road							A	A	A				N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
KPK000500	Kaupokonui River 250m upstream of Kaponga oxidation ponds							B	B	B				N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
KPK000660	Kaupokonui River upstream of Railway bridge							C	C	B				N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
KPK000880	Kaupokonui River at Upper Glenn Road							D	C	C		C		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
KPK000990	Kaupokonui River 200m upstream of Kaupokonui Beach footbridge							D	C	C				N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
KPK000995	Kaupokonui River at mouth													D	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
KTK000150	Katikara Stream at Carrington Road							A	A	A				N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Site code	Site name	Periphyton (trophic state)	Ammonia (toxicity)	Nitrate (toxicity)	Suspended fine sediment	*E. coli* (regional sites)	Fish-IBI	Macroinvertebrates SQMCI	Macroinvertebrates MCI	Macroinvertebrates ASPM	Deposited fine sediment	Dissolved oxygen (rivers)	Dissolved reactive phophorous	*E. coli* (primary contact sites)	Phytoplankton (lakes)	Total nitrogen (lakes)	Total phosphorus (lakes)	Cyanobacteria (lakes)	Submerged plants (natives)	Submerged plants (invasive species)	Lake-bottom dissolved oxygen	Mid-hypolimnetic dissolved oxygen
KTK000248	Katikara Stream 600m upstream of mouth							C	C	B				N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
MGE000970	Mangorei Stream at State Highway 3 Bridge							C	C	B				N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
MRK000420	Mangaoraka Stream at Corbett Road		B	A	A	E		C	C	C			B	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
MTT000125	Mangatete Stream at Carrington Road						A							N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
MWH000490	Mangawhero Stream 200m downstream of rail bridge							D	C	C				N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
OKR000497	Oakura River at mouth													D	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
OTK000175	Otakeho Stream at Waimate West water intake weir						C							N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PNH000200	Punehu Stream at Wiremu Road	A	A	A	A	C		A	A	A	A		D	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PNH000900	Punehu Stream at State Highway 45	A	B	B	C	E		B	C	C	A		D	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
STY000300	Hangatahua (Stony) River at Mangatete Road	A	A	A	A	A		A	A	B	D		C	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
STY000400	Hangatahua (Stony) River at State Highway 45							A	B	B				N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
THN000499	Te Henui Stream at mouth													D	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
TMR000150	Timaru Stream at Carrington Road						B	A	A	A				N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
TMR000375	Timaru Stream at State Highway 45							C	B	B				N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
TMR000497	Timaru Stream at mouth													D	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
WGA000260	Waiongana Stream at State Highway 3A bridge							C	C	B				N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
WGA000450	Waiongana Stream 40m upstream of State Highway 3							D	C	C				N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Site code	Site name	Periphyton (trophic state)	Ammonia (toxicity)	Nitrate (toxicity)	Suspended fine sediment	*E. coli* (regional sites)	Fish-IBI	Macroinvertebrates SQMCI	Macroinvertebrates MCI	Macroinvertebrates ASPM	Deposited fine sediment	Dissolved oxygen (rivers)	Dissolved reactive phophorous	*E. coli* (primary contact sites)	Phytoplankton (lakes)	Total nitrogen (lakes)	Total phosphorus (lakes)	Cyanobacteria (lakes)	Submerged plants (natives)	Submerged plants (invasive species)	Lake-bottom dissolved oxygen	Mid-hypolimnetic dissolved oxygen
WGG000115	Waingongoro River 750m downstream of Te Papa-Kura-o-Taranaki							A	A	A				N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
WGG000150	Waingongoro River at Opunake Road							A	A	A				N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
WGG000494	Waingongoro River at Taumata Park													D	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
WGG000500	Waingongoro River at Eltham Road bridge	C	B	B	A	D		A	B	B	A		C	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
WGG000665	Waingongoro River at Stuart Road							C	C	B				N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
WGG000895	Waingongoro River 150m upstream of State Highway 45							D	C	C				N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
WGG000900	Waingongoro River at State Highway 45		B	B	D	D						B	D	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
WGG000995	Waingongoro River at mouth							D	C	C				D	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
WKH000100	Waiwhakaiho River at Te Papa-Kura-o-Taranaki							A	A	A				N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
WKH000500	Waiwhakaiho River at State Highway 3	C	A	A	A	D		B	B	B	A		D	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
WKH000673	Waiwhakaiho River at Meeting of the Waters													D	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
WKH000800	Waiwhakaiho River at Merrilands Domain													D	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
WKH000920	Waiwhakaiho River at Constance Street							D	C	C				N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
WKH000950	Waiwhakaiho River at mouth							D	C	C				D	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
WKR000500	Waiokura Stream at Skeet Road		B	C	D	E		A	C	B			D	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
WKR000700	Waiokura Stream at Manaia Golf Course		A	C	D	E		A	C	B			D	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
WMK000100	Waimoku Stream at Lucy's Gully							A	A	A				N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Site code	Site name	Periphyton (trophic state)	Ammonia (toxicity)	Nitrate (toxicity)	Suspended fine sediment	*E. coli* (regional sites)	Fish-IBI	Macroinvertebrates SQMCI	Macroinvertebrates MCI	Macroinvertebrates ASPM	Deposited fine sediment	Dissolved oxygen (rivers)	Dissolved reactive phophorous	*E. coli* (primary contact sites)	Phytoplankton (lakes)	Total nitrogen (lakes)	Total phosphorus (lakes)	Cyanobacteria (lakes)	Submerged plants (natives)	Submerged plants (invasive species)	Lake-bottom dissolved oxygen	Mid-hypolimnetic dissolved oxygen
WMK000298	Waimoku Stream at Oakura Beach							D	C	C				N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Lakes																						
LBR000100	Barrett Lagoon at deepest point	N/A	B	N/A	N/A	B	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	C	D	C	A			D	N/A
LRM000002	Lake Rotomanu at western shoreline	N/A		N/A	N/A		N/A	N/A	N/A	N/A	N/A	N/A	N/A	D				D				

Appendix 3 – Identified values in the Volcanic Ring Plain FMU

Primary contact sites

Site	Catchment
Kaupokonui Stream at mouth	Kaupokonui
Lake Rotomanu	Waiwhakaiho
Oakura River at mouth	Oakura
Te Henui Stream at mouth	Te Henui
Timaru Stream at mouth	Timaru
Waingongoro River at mouth	Waingongoro
Waingongoro at Taumata Park	Waingongoro
Waiwhakaiho River at Meeting of Waters	Waiwhakaiho
Waiwhakaiho River at Merrilands Domain	Waiwhakaiho
Waiwhakaiho River at mouth	Waiwhakaiho

Freshwater dependent threatened species

The following table contains those freshwater dependent threatened species that the Council has identified for this FMU. The list is a draft and further work is required to better understand the status of these species across the FMU (including habitats critical to their survival) and to identify additional species (if any) to be added to the list:

Taxa group	Scientific name	Common name(s)	Threat Status	Highly Mobile Fauna[2]
Bats	*Chalinolobus tuberculatus*	Long-tailed bat, Pekapeka,	Nationally Critical	✓
Birds	*Anarhynchus frontalis*	Wrybill, Ngutu-pare	Nationally Vulnerable	✓
	Anas superciliosa	Grey duck, Pārera,	Nationally Vulnerable	✓
	Ardea modesta	White heron, Kōtuku,	Nationally Critical	✓
	Botaurus poiciloptilus	Australasian bittern, Matuku hūrepo,	Nationally Critical	✓
	Callaeas wilsoni	North Island kōkako, Kōkako	Nationally Increasing	
	Charadrius obscurus aquilonius	Northern New Zealand dotterel	Nationally Increasing	✓
	Chlidonias albostriatus	Black-fronted tern, Tarapirohe, Tarapiroe	Nationally Endangered	✓
	Egretta sacra sacra	Reef heron, Matuku Moana,	Nationally Endangered	✓
	Falco novaeseelandiae ferox	Bush falcon, Kārearea, Kāeaea	Nationally Increasing	✓
	Hydroprogne caspia	Caspian tern, Taranui,	Nationally Vulnerable	✓
	Hymenolaimus malacorhynchos	Whio, Blue duck	Nationally Vulnerable	✓

[2] As identified in [Appendix 2: Specified highly mobile fauna] of the National Policy Statement for Indigenous Biodiversity (NPS-IB).

Taxa group	Scientific name	Common name(s)	Threat Status	Highly Mobile Fauna[2]
	Poliocephalus rufopectus	New Zealand dabchick, Weweia, Totokipio, New Zealand grebe	Nationally Increasing	
	Notiomystis cincta	Hihi, Stitchbird	Nationally Vulnerable	
Fish	*Galaxias postvectis*	Shortjaw kokopu	Nationally Vulnerable	
	Geotria australis	Lamprey	Nationally Vulnerable	
Vascular plants	*Amphibromus fluitans*	Water brome	Nationally Vulnerable	
	Centipeda minima subsp. minima	Sneezeweed, Centipeda	Nationally Endangered	
	Crassula peduncularis		Nationally Critical	
	Dactylanthus taylorii	Wood rose, Pua o te reinga, Flower of Hades	Nationally Vulnerable	
	Gratiola concinna		Nationally Endangered	
	Kunzea robusta	Manuka, Kanuka, Kopuka, Rawirinui, Maru	Nationally Vulnerable	
	Leptospermum scoparium var. scoparium	Manuka, Tea tree, Kahikatoa	Nationally Vulnerable	
	Libertia peregrinans	New Zealand iris, Mikoikoi	Nationally Vulnerable	
	Limosella (b) (CHR 515038; Manutahi)		Nationally Critical	
	Lophomyrtus bullata	Ramarama, bubble leaf	Nationally Critical	
	Lophomyrtus obcordata	Rohutu, New Zealand myrtle	Nationally Critical	
	Melicytus drucei	Mt Egmont Shrub Mahoe, Druces mahoe	Nationally Endangered	
	Metrosideros colensoi	Climbing rata	Nationally Vulnerable	
	Metrosideros diffusa	White rata	Nationally Vulnerable	
	Metrosideros perforata	White rata, Akatorotoro, Akatea	Nationally Vulnerable	
	Metrosideros robusta	Northern rata	Nationally Vulnerable	
	Myosotis brevis		Nationally Vulnerable	
	Neomyrtus pedunculata	Rohutu, Myrtle	Nationally Critical	
	Ophioglossum petiolatum	Stalked adders tongue fern	Nationally Critical	
	Pterostylis micromega	Swamp Greenhood	Nationally Endangered	
	Ranunculus recens		Nationally Vulnerable	
	Scandia rosifolia	Koheriki	Nationally Critical	
	Syzygium maire	Swamp maire, Maire tawake, Waiwaka	Nationally Critical	

The Council is also assessing the following threatened species for their 'freshwater dependence':

- *Eudynamys taitensis* (Long-tailed cuckoo, Koekoeā, Koekoea, Kohoperoa, Long-tailed koel)
- *Oligosoma aff. infrapunctatum* "*Southern North Island*" (Kupe skink, Tamatea skink)
- *Notoreas perornata* "*TK/NN*" (Pimelea looper moth)
- *Brachyglottis kirkii var. kirkii* (Kohurangi, Kirk's daisy)
- *Craspedia (k)* (CHR 283173; "coast")

- *Crassula manaia*
- *Lepidium flexicaule* (Coastal cress)
- *Lepidium oleraceum* (Nau, Cooks scurvy grass)
- *Metrosideros carminea* (Crimson rata, Carmine rātā)
- *Metrosideros fulgens* (Rata, Akatawhiwhi)
- *Solanum aviculare* var. *aviculare* (Poroporo)

Additional information provided by other organisations or individuals will be valuable to this process.

Watercraft and Tauranga waka sites

Location/site name	Catchment	Boating	Tauranga waka
Ōpunake Lake	Waiwhakaiho	✓	
Lake Rotomanu	Waiaua	✓	

Fishing values

The following freshwater fish are found within the Volcanic Ring Plain FMU and are valued for fishing:

Whitebait species		Other species	
Scientific name	**Common name**	**Scientific name**	**Common name**
Galaxias fasciatus	Banded kokopu	*Salmo trutta*	Brown trout
Retropinna retropinna	Common smelt	*Mugil cephalus*	Grey mullet
Galaxias argenteus	Giant kokopu	*Geotria australis*	Lamprey
Galaxias maculatus	Inanga	*Anguilla dieffenbachii*	Longfin eel
Galaxias brevipinnis	Koaro	*Perca fluviatilis*	Perch
Galaxias postvectis	Shortjaw kokopu	*Oncorhynchus mykiss*	Rainbow trout
		Anguilla australis	Shortfin eel

The identified fishing areas for recreational fishing are:

Catchment	Sub-catchment/reach	Trout	Whitebait
Hangatahua River	Main stem	✓	
Waiongana Stream	Mangaoraka Stream	✓	
Waiongana Stream	Main stem	✓	✓
Huatoki Stream	Main stem	✓	
Kaupokonui Stream	Main stem	✓	
Kaupokonui Stream	Mangawhero Stream	✓	
Kaupokonui Stream	Little Dunns Creek	✓	
Kapuni Stream	Main stem	✓	
Oakura River	Main stem	✓	✓
Okahu Stream	Main stem	✓	
Otakeho Stream	Main stem	✓	
Taungatara Stream	Main stem	✓	
Te Henui Stream	Main Stem	✓	
Waiaua River	Main stem	✓	

Catchment	Sub-catchment/reach	Trout	Whitebait
Waiaua River	Lake Ōpunake	✓	
Waingongoro River	Mangatoki Stream	✓	
Waingongoro River	Main stem	✓	
Waiwhakaiho	Mangorei Stream	✓	
Waiwhakaiho	Lake Rotomanu	✓	
Waiwhakaiho	Lake Mangamāhoe	✓	
Waiwhakaiho	Lower reaches of the main stem (Audrey Gale Park – to river mouth)	✓	✓
Waiwhakaiho	Upper reaches of the main stem (Egmont National Park to Lake Mangamahoe)	✓	
Tapuae Stream	Main stem	✓	
Timaru Stream	Main stem	✓	✓
Warea River	Main stem	✓	