Draft Internal Report

Incorporating Mātauranga Māori into the Monitoring of Freshwater in Taranaki.

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Overview

To fulfil the requirements of the National Policy Statement for Freshwater (NPS-FM) and increase Māori participation in freshwater management, the Taranaki Regional Council is required to incorporate mātauranga Māori (traditional Māori knowledge) alongside western science into freshwater planning and monitoring. Every regional council is to implement these requirements so it is completed no later than 31st December 2025.

To do this effectively, the Taranaki Regional Council (TRC) must first have a good understanding of mātauranga Māori regarding freshwater in the Taranaki region. This must include finding how Māori determine the quality of the waterway (both spiritually and physically) based on traditional knowledge, and then finding indicators and tools to monitor those indicators. This information can be obtained by literary research and through engagement with local iwi.

The purpose of this report[1] is to provide insight into the Māori worldview in order for the Council as the statutory resource manager to comprehend the concept of mātauranga Māori. A brief overview of the successes and challenges that other regional councils are experiencing while incorporating mātauranga Māori into their freshwater planning and monitoring will be presented. Some frameworks and monitoring tools currently being used around the country will also be identified as well as indicators from both a Māori perspective and a western science view. This will provide a basis for consultation, discussion and debate in what is a complex area.

The report then makes some conclusions that include consideration of some recommendations to consider when incorporating mātauranga Māori into its freshwater planning and monitoring framework.

The report is presented as an internal draft report because it has not been subject to iwi consultation. The final report will be presented back to the Council's Policy and Planning Committee.

[1] The primary author of this report was Miss S Norgate of Ngaa Rauru a Otago University student working for the Council over the 2017/18 Christmas holidays

1 Introduction

1.1 General

The sustainable management of freshwater resources is required by the Resource Management Act 1991 (RMA) and is essential to New Zealand's economic, environmental, cultural and social well-being. Due to increasing demands and pressures on New Zealand's freshwater resources new policy and planning processes, such as reforms to the National Policy Statement for Freshwater Management under the RMA, were introduced to improve processes for engagement and decision-making around freshwater resources.

Fresh water is necessary for human functioning, and it is also highly valued for its commercial and non-commercial uses. Fresh water underpins important parts of New Zealand's biodiversity and natural heritage. The challenge freshwater resource managers are faced with is to provide for all the different values that are important to New Zealanders while also promoting sustainable management of the resource. This is a complex and challenging area. Of particular interest to Māori is the protection and revitalisation of the freshwater systems, given their complex and long-held connection with water.

1.2 The Treaty of Waitangi/ Te Tiriti o Waitangi

The Government is becoming increasingly aware of the relationship between Māori and the environment. Through the Treaty of Waitangi/Te Tiriti o Waitangi and legislation such as the RMA, Māori have been acknowledged as having an important role to play. The Treaty of Waitangi is the foundation of the Crown and iwi/hapū relationships with regard to freshwater resources and Treaty principles are extremely important in guiding engagement processes.

Mana Whakahono-a-Rohe (MWR) are written agreements between local government and iwi authorities on ways tangata whenua may participate in RMA decision-making, and to assist councils with their statutory obligations to tangata whenua under the RMA. MWRs can provide information on iwi and hapū input to environmental management processes, such as plans and resource consents.

1.3 National Policy Statement for Freshwater Management (NPS-FM)

National Policy Statements are issued by central government to provide direction to local government about how they carry out their responsibilities under section 45 and 46 of the RMA when it comes to matters of national significance. The National Policy Statement for Freshwater Management 2014 (NPS-FM) recognises the relationship between Māori and fresh water and highlights the recognition of Māori values in fresh water management.

The NPS-FM sets out objectives and policies that direct local government to manage water in an integrated and sustainable way. These objectives are to provide for economic growth within set water quantity and quality limits, in accordance with the National Objectives Framework (NOF). It is a step to improve freshwater management at a national level.

An important part of the NPS-FM is the engagement between tangata whenua and resource managers, and the integration of mātauranga Māori (Māori knowledge) into freshwater monitoring and management. While there is only one specific policy that states "mātauranga Māori" is to be

incorporated, (Policy CB (1) dealing with monitoring plans), mātauranga Māori is in fact being reflected through at least five different objectives in the NPS-FM.

The main objectives regarding mātauranga Māori in the NPS-FM are discussed below.

1.3.1 Objective AA1 –Te Mana o te Wai

Objective: *To consider and recognise Te Mana o te Wai in the management of fresh water.*

Te Mana o te Wai is the integrated holistic well-being of a freshwater body. Upholding this objective acknowledges and protects the mauri of the water and provides for the health of the environment, waterbody and the people. This section of the NPS-FM requires that regional councils should work with their communities, including tangata whenua, to understand what values are held for each freshwater body in their region. Councils should then set freshwater objectives and limits guided by these values, recognising that all decisions made about freshwater management should be made by putting the health and well-being of the water at the forefront of their discussions.

1.3.2 Objective C1- Integrated Management

Objective: *To improve integrated management of fresh water and the use and development of land in whole catchments, including the interactions between fresh water, land, associated ecosystems and the coastal environment.*

The policies under this objective include the need for regional councils to recognise the interactions ki uta ki tai (from the mountains to the sea) and to manage fresh water and land use development in catchments in an integrated, sustainable way. It is imperative that regional councils have knowledge of the activities that impact on the quality and quantity of fresh water and that the management strategies remedy or mitigate adverse effects.

1.3.3 Objective CA1- National Objectives Framework (NOF)

Objective: *To provide an approach to establish freshwater objectives for national values, and any other values, that is nationally consistent and recognises regional and local circumstances.*

The NPS-FM requires councils to set objectives and limits for freshwater quality and quantity in accordance with the NOF. The NOF provides a list of compulsory values and other national values accompanied by relevant attributes. The compulsory values are ecosystem health and human health for recreation. Other national values include natural form and character, mahinga kai, fishing, irrigation and food production, animal drinking water, wāhi tapu, water supply, commercial and industrial use, hydro-electric power generation, transport and tauranga waka. Attributes for these values are categorised into four states, A, B, C or D, reflecting different levels from A-excellent to D-unacceptable. D is the attribute that falls below the national bottom line and the NPS-FM requires that the freshwater management unit is maintained at its current level or improved, without going below the national bottom line. The freshwater objectives may also include any other values that the regional council considers appropriate through the involvement of iwi and hapū in freshwater management and decision- making.

While the NOF can be extremely useful regarding interests that fall into the categories of the compulsory and other national values, the framework as a whole is as relevant to Māori as it is to other New Zealanders. There are many other frameworks developed by Māori to understand, manage and communicate knowledge about their natural and spiritual environment that can incorporate

mātauranga Māori alongside western science. Discussed later in this report are some well-known frameworks that have helped iwi across New Zealand collaborate with regulatory authorities in regards to freshwater management.

1.3.4 Objective CB1- Monitoring Plans

Objective: *To provide for an approach to the monitoring of progress towards, and the achievement of, freshwater objectives and the values identified under Policy CA2 (b).*

Policy CA2(b) requires regional councils , through discussion with communities, including tangata whenua, to identify the values for each freshwater management unit which must include , the compulsory values and any other national values that regional councils consider appropriate.

Policy CB (1) under this objective is where mātauranga Māori is specifically mentioned.

It requires regional councils to develop a monitoring plan to achieve the freshwater objectives identified earlier. These monitoring frameworks must include at least the monitoring of macroinvertebrate communities, measures of the health of indigenous flora and fauna, and mātauranga Māori. Monitoring plans are also intended to recognise the importance of long term trends in data that can be assessed with statistical analysis.

1.3.5 Objective D1-Tangata Whenua Roles and Interests

Objective: *To provide for the involvement of iwi and hapū, and to ensure that tangata whenua values and interests are identified and reflected in the management of fresh water including associated ecosystems, and decision-making regarding freshwater planning, including how all other objectives of this NPS are given effect to.*

This requires regional councils to involve iwi/hapū in the management of fresh water, work with them to identify their values and interests and reflect those values and interests in decision-making. The community engagement that councils will undertake to provide for Te Mana o te Wai in freshwater management will help councils meet these requirements.

2 Mātauranga Māori

2.1 Understanding Mātauranga Māori

The first step in order to fulfil the requirements of the NPS-FM and for successful implementation of mātauranga Māori into freshwater planning and monitoring is for regional councils to understand the meaning of mātauranga Māori.

Mātauranga Māori, a form of indigenous knowledge, can be generally defined as "the knowledge, comprehension or understanding of everything visible and invisible existing in the universe" (Marsden, 1988). It is essentially traditional knowledge based on long standing interactions, through time and space, between people and their surrounding environment. Mātauranga Māori encompasses not only what is known, but how it is known. It can refer to Māori concepts, knowledge systems, philosophies, frameworks and principles founded on traditional knowledge and beliefs (Harmsworth et al 2016). Because mātauranga Māori is holistic, there are no specific rules or physical reasoning for the actions that the entire Māori culture carried out. This is quite different to western thinking, where everything has a scientific explanation. This disjunction between the Māori world view and the western world, and possible tools to address this, will be discussed in the next section.

For more than 800 years, traditional Māori knowledge has been accumulated and handed down through the generations from tūpuna, rangatira, kaumātua, kuia and tohunga. Being an oral culture, korero is the key to unlocking and passing on knowledge. Each iwi have specific ways of doing things and this is called mātauranga-a iwi, knowledge that is specific to an iwi. This is because each iwi have their own protocols and perspectives that link them to their rohe (Ngā Kaitūhono, 2012). A common mistake in earlier studies of mātauranga Māori, was that information about Māori knowledge was often de-contextualised and confused because writers tried to apply values and processes that they had derived from one iwi, to all of the Māori culture. The information had been removed from the environment and the people that they were intended for (Ngā Kaitūhono, 2012), which created a false interpretation of the Māori world view. In this sense, all information captured on mātauranga Māori should be treated carefully in order for it not to be misinterpreted.

Mātauranga Māori can be represented through many forms, however because the NPS-FM requires the inclusion of tangata whenua values, we will look at mātauranga Māori represented through these values. There are core values that underlie the activities and reasoning of the Māori culture. Māori values can be defined as "instruments through which Māori people experience and make sense of the world" (Marsden 1998). Important values include tikanga (customary protocols), kaitiakitanga (environmental guardianship), tino rangatiratanga (self-determination), mana whenua (authority over land and resources, whakapapa (genealogy, links to ecosystems), whānaungatanga (family relationships), manaakitanga (acts of giving and caring for), arohatanga (notions of care, respect, love, compassion), wairuatanga (spirituality) and whakakotahitanga (consensus, participatory inclusion for decision-making), some of which are clearly described in Jefferies and Kennedy's (2009) article. (Barlow 1993; Harmsworth and Awatere, 2013; Awatere and Harmsworth, 2014).

The values that underlie mātauranga Māori also form the basis of many Māori protocols and frameworks, including models that guide decision-making for natural resource management (Awatere et al, 2017).

2.2 Mātauranga Māori and Freshwater Management

As indicated previously, a highly important Māori customary value in Te Ao Māori (the Māori world view) is kaitiakitanga (Durette et al. 2006; Harmsworth and Awatere 2013). Māori have a duty as kaitiaki to protect life-sustaining resources and spiritual connections with resources such as waterways and land, for future generations. Since European settlement and agricultural and urban development (land clearing) water quality and quantity have impacted and mahinga kai significantly impacted. The kaitiakitanga role of tangata whenua has in turn, significantly weakened, and this is a significant issue for Māori.

The maintenance, protection and restoration of mauri is a cultural responsibility of kaitiaki Māori. Mauri is the life-giving ability of an ecosystem, the essence that binds the physical and spiritual elements of all things together, generating and upholding all life. All elements of the natural environment possess a life force and all life forms are related. Changes to the ecosystems of rivers and streams through activities such as the introduction of exotic species, removal of native vegetation from river and stream banks, sedimentation and erosion, has led to the degradation, and in some cases the death, of the mauri of some catchments. It diminishes customary resources and habitat for flora and fauna which in turn decreases diversity and abundance. These are considered taonga in Te Ao Māori (Harmsworth et al. 2013) and a source of living.

Mahinga kai is also an important value of tangata whenua provided by rivers and streams. This includes fish and plant species used as food, as well as food gathering sites and customary practices associated with food gathering. Freshwater taonga species such as tuna, piharau, koura, whitebait and ika were used as a source of kai and were also provided to manaaki manuhiri at hui and tangihanga. This was tikanga for most Māori villages and because many of these taonga species have disappeared or lessened, these customary practices are no longer able to be carried out. This decreases the mana of the tangata whenua as they are also no longer able to provide for their whanau or manuhiri, either physically or spiritually, as they previously were.

The role of rivers and streams in creation stories and their past use for access routes or transport are extremely important to Māori in terms of whakapapa. In this way, links between past, present and future generations are represented and this reinforces tribal identity. Every iwi and hapū has associations with particular freshwater bodies – streams, springs, rivers, lakes, wetlands, groundwater – that are reflected in their whakapapa (ancestral lineage), waiata (song), and whaikorero tuku iho (stories of the past). Site names, traditional and customary materials, and waahi tapu also represents physical and emotional links to the past and protection of these taonga tuku iho are integral to upholding the health and mauri of freshwater ecosystems.

The Māori relationship with the environment, both animate and inanimate aspects, are part of the Māori identity so protecting that connection is of significant concern. Māori have a “ki uta ki tai” approach, recognising the importance of mauri and that all elements of the environment are connected. In this way, they believe freshwater must be seen and managed in an integrated holistic manner that is linked to all other resources within the environment. Māori ancestors had tikanga for the proper and sustainable use of the resources associated with water that enabled them to do this.

In the western science view and with current resource management strategies, the focus is a fully technical approach based on scientific evidence and biological/physical reason (Tipa and Teirney, 2006). Western science is currently predominating in resource management strategies because it

allows quantitative data to be gathered and statistical trend analyses to undertaken. Because mātauranga Māori is a form of indigenous knowledge, built on philosophies and the inclusion of holistic and spiritual connections which are hard to measure and compare, it does not naturally fit western science. Mātauranga Māori and western scientific measures of stream health are focussed at completely different levels with the primary form of disjunction being the spiritual connection between Māori and freshwater. From a western science perspective, water may carry contaminants at a level that is non-toxic to humans and is drinkable. However, Māori require their drinking water to be free of spiritual pollution, where certain discharge activities, regardless of the level of physical contamination, are prohibited.

In order to fulfil the requirements of the NPS-FM, the challenge is to find meaningful ways of incorporating cultural perspectives and values into current resource management decision-making, including monitoring.

2.3 Informing Mātauranga Māori

Iwi/hapū engagement and involvement is the foundation of successful implementation of the NPS-FM and incorporating mātauranga Māori into freshwater planning and monitoring. Capacity and capability of both iwi/hapū and councils have a large effect on the process. This also includes the ability of council staff to comprehend mātauranga Māori.

It is important to note that there is no single way to engage with iwi and hapū. It is also a challenge finding how to select the right representation for the iwi/hapū in the region, as it is practically and financially unrealistic for every individual kaitiaki group in the region to be directly involved. There may be competing values between different iwi/hapū and the fact that not all hapū affiliate with an iwi. Some hapū may have concerns that their iwi does not always represent their interests. In this instance it is up to the Council to decide how they can efficiently involve the tangata whenua and incorporate mātauranga Māori in their region.

In general, Geographic Information Systems (GIS) can be used to gather information through identifying and recording areas of Māori significant sites or special interest areas to improve the understanding of Māori values in policy planning (Jefferies and Kennedy, 2009). GIS is also a useful tool to identify priority areas for management and restoration (Harmsworth et al. 2016).

Iwi management plans (IMPs) are also an extremely helpful resource to have when obtaining holistic information from iwi. They are able to codify iwi values to support and collaborate with those people wanting to work on environmental issues and agencies that have the power to implement processes dealing with environmental issues.

2.4 Other Regional Councils and Mātauranga Māori

In a review by the Ministry for the Environment on the implementation of the NPS-FM from regional reports (Ministry for the Environment, 2017), it was clear that all councils expressed a willingness to incorporate mātauranga Māori into their planning and monitoring but were unsure how to do so. In general, Councils noted that they struggled to identify and reflect cultural values in regional plans because many of these values, including mātauranga Māori, are intangible concepts.

Ministry for the Environment (MfE) expressed in their review that a priority area of focus over the next 5 years was that central and local government need to continue to invest in developing

frameworks for incorporating mātauranga Māori into freshwater planning, including sharing lessons learnt. This section of the report will include a brief overview of the successes and/or challenges other regional councils have experienced when involving tangata whenua and/or incorporating mātauranga Māori into their freshwater policy, planning and monitoring programmes, and is based on the MfE review. The Taranaki Regional Council could learn from this information when implementing the NPS-FM.

2.4.1 Waikato Regional Council (WRC)

The Waikato and Waipa catchments in the Waikato region are managed through a statutory co-governance arrangement with the five river iwi that set a higher standard for iwi involvement than the NPS-FM. The Council notes that each iwi's Treaty settlement provides for their participation in the co-governance and co-management framework for the Waikato and Waipa rivers. The Council also notes that this is the reason why the catchments have been prioritised in the Waikato Region.

The collaborative process they use with iwi is called the Healthy Rivers-Wai Ora project and, regardless of being demanding and time consuming, WRC has been satisfied with the process. The Council says it will likely not replicate it exactly when developing plans in other areas. The project was straining on WRC's capacity, as they estimate the collaborative process was as much as twice the cost of the traditional consultative process, making WRC hesitant to repeat the process to the same extent in the future. Council staff have also been exhausted by the intensive workload sustained over a number of years and staff turnover (of scientists and consultants for example) has been high. The Council has therefore struggled with maintaining institutional knowledge and feels it would be difficult to immediately repeat the process in new areas.

2.4.2 Greater Wellington Regional Council (GWRC)

There are five distinct whaitua (areas) within the region. For each whaitua, GWRC has formed or will form a collaborative group called a whaitua committee. These committees are charged with developing a whaitua implementation programme (WIP) that identifies tangata whenua values and contains freshwater objectives and recommendations for both regulatory and non-regulatory methods of managing water. The committees however, do not have direct decision-making authority.

Feedback from iwi and tangata whenua showed that there was a satisfying level of iwi inclusion in the GWRC. However, the iwi and the GWRC have a strong concern that when mātauranga Māori and science both inform limits, the two sources of knowledge will create conflict when limits are broken or not reached. There is a lack of Māori-centric indicators for ecological health and mahinga kai, and establishing indicators for these values would be useful.

2.4.3 Southland and Otago Regional Councils (SRC and ORC)

Southland and Otago Regional Councils engage with one governing iwi authority group called Te Rūnanga o Ngāi Tahu. They and the territorial authorities in the two regions participate in a joint management committee called Te Rōpū Taiao. This has been in place since the 1990s to discuss resource management and local government issues at a high level. Te Rūnanga o Ngai Tahu also has developed several cultural monitoring tools (discussed later in the report) and these can be used to inform the Council.

SRC is currently working with Te Ao Mārama (the environmental arm of the Southland Ngai Tahu Rūnanga) on cultural indicators and partnered monitoring programmes, as well as with the Department of Conservation to align freshwater monitoring.

ORC has a Memorandum of Understanding (MOU) with Te Rūnanga o Ngai Tahi. This MOU identifies important interests and addresses local and regional resource management issues. It also outlines how to engage for consultation processes (ORC has chosen to use a consultative rather than collaborative process for policy development and planning). The Council notes that this approach has worked efficiently, avoiding the time and expense that collaborative planning processes have required in other regions. ORC does not have dedicated iwi liaison staff. During previous engagements, tāngata whenua representatives have noted the benefits of having specific liaison staff who are able to effectively engage on iwi issues.

2.4.4 Gisborne District Council (GDC)

GDC has formed a freshwater advisory group (FWAG) that has ten iwi and hapū representatives and reflects values of the wider community. As evidence of its commitment to engaging iwi and hapū, GDC cites long-standing co-management relationships and signed MOUs with regional iwi. In addition, GDC signed a Joint Management Agreement in 2015 with Ngāti Porou for co-management of the Waiapu catchment, which was the first of its kind in New Zealand. GDC was also involved with iwi scientists in developing a 'Mauri Compass' (described later in this report) as a means of expressing the mauri of a waterway in terms that could be used in policy and planning. GDC acknowledges that iwi will want to conduct their own monitoring in addition to that done by the Council. However, some iwi expressed concern that they did not have the resources to do this. Regardless, GDC is taking tangata whenua values and mātauranga Māori into account and recognising Te Mana o te Wai. This is reflected through the Te Mauri Compass tool.

2.4.5 Horizons Regional Council (HRC)

HRC has established relationships with all 16 iwi and hapū in the region and is developing memorandums with each iwi. HRC has worked with Landcare Research to develop cultural health indices (discussed later in the report) that recognise Te Mana o te Wai and incorporate both a 'Western science' and a 'Māori science and world view'. HRC believe that the NPS-FM pushes councils to a more collaborative approach and that this could become an issue for both communities and ratepayers. Some communities may not have the capacity to engage in collaborative processes because the timeframes to do this are long and the time demands are high.

2.4.6 Tasman District Council (TDC)

TDC note that the community has high expectations concerning fresh water, but it feels that the community does not fully understand the costs of achieving these expectations.

TDC has however established collaborative freshwater and land advisory groups (FLAGs) of stakeholder representatives to consider objectives and limits in the Waimea and Tākaka catchments. TDC note that the FLAGs were designed to have diverse representation and include people with expertise in the primary sectors, environmental and resource management, recreation, energy generation and mātauranga Māori. However, members are directed to represent the community at

large rather than any one sector. With support from TDC, the FLAGs are also intended to lead engagement back to the wider community.

Although the Motueka catchment had not formally been established as a freshwater management unit under the NPS-FM, a collaborative governance group from the community will be asked to make recommendations for how the catchment will be managed in 2019 (the Motueka Cultural River Health Index discussed later in this report).

2.4.7 Hawkes Bay Regional Council (HBRC)

There is a growing expectation for mātauranga Māori monitoring to support the values identified in the NPS-FM and through working with tāngata whenua. HBRC is willing to begin but is unsure of how to do so or how to incorporate that information into other forms of data. This includes community monitoring and citizen science. Increased data collection to meet NPS-FM requirements also means HBRC has needed to hire staff and invest in improving data management systems. It is possible HBRC will need to pass on costs through rates, if it has exhausted other funding sources.

2.4.8 Summary

The main points from the above for the Taranaki Regional Council are that collaborative relationships are highly beneficial, however are formed over a long period of time. It was found that other regional councils who had formed collaborative groups where committees identified tangata whenua values and objectives to the Council, resulted in less strain on the capability and capacity of both the council and the iwi group. Collaborative process however, consumed more time and money than the consultative process.

It was also stated that mātauranga Māori is not an easy concept to comprehend so the education and involvement of Council staff on the topic would be very beneficial. These processes will be costly, as acknowledged by all councils. The challenge now is for the Taranaki Regional Council to find a cost and time efficient process to incorporate mātauranga Māori into freshwater monitoring and decision-making, which will be the focus of the remainder of this report.

2.5 Taranaki Regional Council and Mātauranga Māori

Eight recognised iwi have rohe within the Taranaki region. Ngaa Rauru Kiitahi, Ngāti Mutunga, Ngāruahine, Ngāti Ruanui, Ngāti Tama, Taranaki Iwi and Te Atiawa have signed Treaty of Waitangi settlement agreements with the crown and discussions between Ngāti Maru and the Crown are underway. Under the Treaty of Waitangi settlements, three iwi representatives from each of the Taranaki waka, are appointed to each of TRC's two main standing committees: the Policy and Planning Committee and the Consents and Regulatory Committee. This ensures tāngata whenua are part of regional governance and decision-making, including for freshwater management, through representation on these committees. The Treaty settlements will also allow iwi to improve their capacity and capability for involvement.

The review from the Ministry for the Environment on TRC's progress towards implementing the NPS-FM acknowledged that TRC is generally good about consulting with iwi, including on applications for resource consents (MfE, 2017). As part of the review of the Fresh Water Plan, TRC prepared and undertook targeted consultation to identify water bodies with outstanding or significant freshwater

values, including rivers with outstanding cultural, traditional and spiritual associations recorded in its GIS.

Iwi Management Plans (IMP) are also being considered in the development of TRC plans. The Council currently has the following IMPs: Ngāti Ruanui Environmental Management Plan (2012), Draft Ngāti Mutunga Iwi Management Plan and Ngaa Rauru Kiitahi- Puutaiao Management Plan. A brief overview of these plans, as well as a small section on a hui with kaumātua of Ngaa Rauru on freshwater values, are described below.

2.5.1 Ngāti Ruanui Environmental Management Plan (2012)

The environmental management plan provided by Ngāti Ruanui identified their values as whakapapa, kaitiakitanga, tikanga, kotahitanga, and manaakitanga.

The mauri of all species is important to Ngati Ruanui, and they state in their plan that they "will work with territorial authorities to determine individual plans for the key catchment areas that it has identified and chosen." They also strongly believe that the environment, including all indigenous species of fish, flora and fauna, are inter-related through whakapapa and all are considered taonga.

2.5.2 Ngāti Mutunga Iwi Management Plan (Draft)

Ngāti Mutunga have identified in their IMP that kaitiakitanga, tino rangatiratanga and tikanga are highly important values for their iwi.

Each river in the Ngāti Mutunga rohe has its own mana and has significant historical and spiritual importance to their people. This relationship is acknowledged by the Crown through statutory acknowledgments over several rivers in the Ngāti Mutunga rohe.

Ngāti Mutunga identify that in order to carry out their kaitiaki duties, kai species need to be abundant and healthy, and the water sources clean and safe enough to drink from and for kids to swim and play in the rivers. The mauri and access to waterways in order to carry out customary activities were also identified as being an issue.

2.5.3 Ngaa Rauru Kiitahi- Puutaiao Management Plan

The key values clearly stated in the IMP for Ngaa Rauru Kiitahi are mana motuhake, rangatiratanga, and Ngaa Raurutanga. These values underpin how Ngaa Rauru people carry out their role as kaitiakitanga. The Te Kaahui o Rauru (TKOR) organisation has been developed to manage this role for the Ngaa Rauru Kiitahi iwi.

After physically meeting with members of Ngaa Rauru at an informal hui with the purpose of gathering information for this report, some predominant values of interest were established. These have been categorised into the National Objectives Framework's national values as an example to provide perspective on what it could look like:

- Mahinga kai- members expressed their concern that because of the degradation of the water way, there was absence of traditional mahinga kai resources, which were previously used to manaaki manuhiri. This in turn had an effect on their mana because they were not able to carry out their traditional tikanga. Overall this was an example of the degradation of the mouri of the waterway. They expressed that the range of kai sources from the awa had decreased dramatically and some species, such as piharau and koura, that were once abundant in the awa are no longer found. Knowledge was also not able to be transferred down generations because there was a scarce

amount of food sources and therefore the opportunity to learn about food preparation and storage was rare.

- Water supply- the ability to drink the water from the Waitotara awa had completely diminished over a period of 25 years.
- Human Health for recreation- moko are no longer able to connect with the water way as the tangata whenua were able to via activities such as swimming and gathering of mahinga kai.

2.6 Challenges for Taranaki

In order to incorporate mātauranga Māori into freshwater planning and monitoring in Taranaki, iwi values need to be considered. In general, regional councils are able to gather information on Māori values through informal or formal hui and/or documents, iwi representatives and iwi communication officers as stated previously in the report. While the Council has information about values of some of the iwi, it needs to engage with all iwi as mātauranga Māori may differ between iwi.

It is important to note that a clear message obtained from other councils is that collaborative processes are generally long and expensive so the Council needs to develop a cost-effective process to develop a monitoring plan.

A number of tools can be applied that blend mātauranga Māori With western science to monitor cultural values in freshwater systems, and these are discussed in the next sections of the report. Following appropriate engagement with iwi, the Council could determine indicators and monitoring tools that incorporate mātauranga Māori alongside western science.

3 Frameworks and Monitoring tools

3.1 Planning Frameworks

The key to developing effective engagement between iwi/hapū and authorities is building a relationship. This report will not include how to develop the relationship between local authorities and iwi/hapū, however a paper written by Garth Harmsworth (2005) provides guidelines that could be useful.

The NPS-FM requires the values of the tangata whenua to be established and freshwater objectives and limits to be set. It is more feasible for the framework chosen to follow a set of protocols in order to do this, so both parties are at the same level of agreement and understanding. The Tikanga Māori based framework is an example of this.

3.1.1 Tikanga Māori-based framework

Tikanga is an important value in Te Ao Māori and to central government. It is also identified as an important value to Ngāti Mutunga and Ngāti Ruanui in their IMPs and would most likely be considered an important value to all iwi across the region. A tikanga Māori-based framework built on mātauranga Māori provides guidelines or a process of steps aimed to identify issues and then achieve desired freshwater planning and management outcomes for Maori (Robb et al. 2015; Awatere and Harmsworth 2014; Harmsworth et al. 2013; Harmsworth et al. 2015; Harmsworth et al 2016; Jefferies and Kennedy, 2009; Scheele et al. 2016). This framework is consistently recommended by Landcare Research when integrating mātauranga Māori into freshwater management as it applies order from start to finish of the process that is agreed upon by all parties.

An example of possible tikanga Māori-based framework steps are as follows, but could vary between type of project and which iwi/hapū are using it:

1. Mana Whakahaere: a treaty-based planning framework is used for engagement and policy development where the Treaty of Waitangi principles are the core of the framework (co-governance, co-planning and co-management).

2. Whakamāramatia ngā Pou Herenga: tangata whenua values (metaphysical and physical as stated in the core values section) are defined and reflected in engagement processes. These values can be represented in many different forms.

3. Whakamāramatia ngā Huanga/Moemoeā: shared outcomes and visions are defined at the beginning of the process.

4. Whakamāramatia ngā Uaratanga: goals and objectives are established to achieve these outcomes. Involvement of iwi/hapu in freshwater management is integral to meeting requirements of the NPS-FM.

5. Whakamāramatia ngā Ritenga: define limits for the co-management of natural resources.

6. Whakamāramatia ngā Kaupapa: rules, methods and policies are developed.

7. Whakamāramatia ngā Aroturukitanga: implementing a monitoring programme where the links between science and cultural indicators are identified and accounted for. These help measure progress towards or away from the stated goals and outcomes.

8. Whakamāramatia ngā Mahi/Mahinga: actions on the ground that demonstrate kaitiakitanga and progress iwi/hapū towards their goals/objectives/aspirations through tangible projects. This could include developing collaborative processes with councils.

This framework example is important in engagement processes and management. The most important values of this framework are co-governance, co-planning and co-management between authorities and the Maori community, and that the relationships should be maintained and strengthened over time. These are also the main principles of the Treaty of Waitangi and this framework has been used and verified as successful in increasing iwi/Māori participation in freshwater management decision-making and cultural monitoring (NIWA, 2017).

3.2 Monitoring Frameworks and Tools

After the planning frameworks are established, monitoring frameworks and tools need to be established to measure progress. Monitoring is used to articulate values as well as to assess (qualitatively or quantitatively) and monitor changes to the environment.

To give effect to the NPS-FM, Council is required to provide a monitoring approach that includes at least mātauranga Māori and a number of measures to monitor progress including the Macro Invertebrate Index (MCI) and measures of the health of indigenous flora and fauna. To do this, Council first needs to establish indicators that reflect Māori values and can show changes in the state of environment on matters of interest. We can align this vocabulary with that of the NOF and refer to an indicator as an attribute relevant to the specified values of the iwi/hapū being provided for. The limitation of incorporating mātauranga Māori into science-based monitoring is that while quantitative values can easily be assigned a metric, values such as wairua, tapu and mauri cannot.

A report on understanding freshwater taonga fish populations (Williams et al., 2017) acknowledged how mātauranga Māori has been and can be incorporated into freshwater monitoring of taonga species. The report recognised that along with other qualitative and scientific methods, mātauranga Māori can be used to fill in spatial and temporal details (e.g abundance and distribution of taonga species) in the monitoring process.

There are a wide variety of tools that have been and are currently being used by resource managers and iwi/hapū all across the country that blend mātauranga Māori and western science to assess cultural values in freshwater systems. These monitoring methods can also identify attributes and indicators relevant to the iwi/hapū or community they were developed for. Some of these tools are also being adapted for use from different Māori groups around New Zealand, because as stated before, not all iwi/hapū have the same values and interests. Resource managers must engage with Māori in their region to get a better understanding of how they measure their values. Discussed below are some examples of cultural monitoring tools including indicators currently being used that could be relevant, or could be adapted and used, for monitoring in the Taranaki region.

3.2.1 Cultural Health Index (CHI)

Originally developed for rivers and streams, the cultural health index (CHI) arose from concerns of Te Rūnanga o Ngāi Tahu and the Ministry for the Environment that limited attention had been paid to the incorporation of Māori values in river management(Nelson and Tipa, 2012; Tipa and Teirney, 2006; Jefferies and Kennedy, 2009, Hutchings et al, 2017). The CHI recognises and expresses Māori values through indicators and links mātauranga Māori to western scientific methods. Values recognised in the CHI are mauri, whakapapa, wāhi tapu and wāhi taonga, rangatiratanga, mahinga kai, taonga, kaitiakitanga and tikanga Māori (mana and mana whenua).

The CHI and its assessment methods are becoming commonly accepted and used by many Māori groups around New Zealand because of its ability to be adapted to suit specific requirements. Initially developed and piloted by Ngāi Tahu on the Taieri and Kakanui rivers in the South Island, refinement and testing has been carried out by the Ngāti Kahungunu iwi on the Tukituki River in Hawkes Bay. More recently, iwi/hapū groups in the Motueka catchment have adapted and applied the CHI (discussed in section 3.2.3). It has also evolved to help Māori participate in other resource management processes such as coastal areas, kauri systems, estuaries and wetlands.

The structure of the CHI is made up of three components: site status; mahinga kai; and a cultural stream health measure. These components are scored individually and are then bought together in an overall score. The cultural indicators that are monitored in this model are heritage sites, taonga species (flora and fauna), water quality and mahinga kai- which are collectively assessed as mauri.

The first part of the site status component assesses the significance of a freshwater site to Māori, to distinguish whether it is a traditional site or a contemporary site. The second part determines whether Māori would return and use the site in the future, believing it is able to sustain the cultural uses it has had in the past, or not.

There is then four parts to the mahinga kai component of the CHI, each scored from 1-5. Examining the health of mahinga kai recognises that the mauri is represented by the physical characteristics of a freshwater resource. The first part requires the identification of all mahinga kai species present at the site, and scored depending on the number of species present. The second part is a comparison of the species present today with the species sourced traditionally from the site (which is information that would be obtained through mātauranga Māori). The third component is to assess tangata whenua access to the site where 1 is no access and 5 is legal and physical access. The fourth and final component requires an assessment of whether they would return to the site in the future and use it as they did in the past (for gathering kai, traditional practices etc.). There are only two ratings and they are No=1 and 5=yes. These scores are then averaged to produce a single score out of 5.

The third and final component of the CHI is the cultural stream health measure (CSHM). Rating eight indicators on a scale from 1-5 and then averaging them gives an overall score. The indicators assessed in the CSHM are catchment land use, riparian vegetation, use of the riparian margin, riverbed condition, manipulation of the river channel, water clarity, and water flow and water quality. Originally there were 19 indicators, however statistical testing of correlations and regressions between indicators was carried out to ensure several indicators were not assessing the same condition. This also produced an effective measure that could be repeatable and consistent, irrespective of iwi or water catchment. These indicators are the most objective and accurate reflections of tangata whenua evaluations of overall stream health.

3.2.2 State of the Takiwā (SoT)

State of the Takiwā (SoT), developed again by Te Rūnanga o Ngāi Tahu, is based on the ki uta ki tai approach. It is described as "an environmental monitoring and reporting process that integrates mātauranga Māori and western science…that takes into account tangata whenua values" (Nelson and Tipa, 2012; Pauling et al 2007; Pauling and Arnold, 2009; Orchard et al 2012). The major objective of SoT is to ensure that tangata whenua can build robust and defensible information on the health of the environment, which can be used to inform policy planning from external agencies such as local councils. The SoT approach takes into account Māori cultural values including mauri and mahinga kai, as well as scientific measures of environmental and ecosystem health to help make better decisions on how to manage these into the future.

Three themes are reflected in SoT: mahinga kai; mauri, mana and manaaki; and finally mātauranga. Mātauranga Māori enables Ngāi Tahu to provide historical accounts and knowledge of the past and changes, particularly of the health and wellbeing of the mauri, that have occurred to the natural environment in their Takiwā.

Mahinga kai is the main contributor with which Ngāi Tahu identify themselves with the environment. Mahinga kai customs are central to their ongoing spiritual, economic, social and cultural well-being. They require that in order to fulfil this relationship, species and their habitat are maintained in pristine condition.

Mauri, mana and manaaki are integral values that Ngāi Tahu require to be part of any environmental monitoring and reporting. Mauri is a taonga that provides a spiritual link to the past, present and future for Ngāi Tahu. Upholding the mauri for Ngāi Tahu has a direct relationship to their ability as an iwi/hapū or whanau to provide manaaki to their manuhiri and in turn has an effect on their mana.

The Takiwā online data-base system is a diagnostic tool for identifying issues and sites of concern to iwi and allows for remedial action to be prioritised, implemented and monitored for performance over time. It is also used to make the information more defendable, accessible, usable and quantitative. The baseline information is collected through past interviews, manuscripts and literature. It can also be collected through engagement with Māori, particularly kaumātua who have significant knowledge on the past use and condition of the waterway (this is the incorporation of mātauranga Māori). Current information and data is provided by councils from CHI, SHMAK (discussed later in the report) and interviews. The collection of this information forms the core of the current state of the Takiwā. It is important to be able to see changes in state of the environment over time and find out why this has happened.

Monitoring is then carried out with the CHI or SHMAK process depending on the site. Electric fishing surveys and E. coli testing are also used. Monitoring forms and analyses are carried out on the data base and the reporting/policy development is the final product of the monitoring programme. Ngāi Tahu then use that information to complete the cycle over again.

3.2.3 Ngā Atua based framework

The Ngā Atua based framework is based on whakapapa- an extremely important value across all of the Māori culture used as a means of identity. In the Māori worldview, the origin of the world and the universe can be traced back through a series of genealogical webs, beginning with nothingness to a supreme god, to emerging light, to the creation of Ranginui (sky-father) and Papatūānuku (earth-mother) to the birth of their children who are deemed as the Atua (departmental gods). Wedged between the darkness of their parents, the children prised apart Ranginui and Papatūānuku in order to create light and flourish. Ranginui formed the sky and rain as he wept for his wife and Papatūānuku formed the land in order to provide sustained nourishment for all her children. Following this was the creation of all life on Earth.

In this sense, Māori are placed in an environmental context with all other flora and fauna. As part of this ancestry, a large number of responsibilities and obligations were conferred on Māori to sustain and maintain the wellbeing of the people, communities and natural resources. Māori believed that small shifts in the mauri or life force of any part of the environment, for example through use or misuse, would cause shifts in the mauri of immediately-related parts, which could eventually affect the whole system. This framework has a ki uta ki tai approach, like the SoT, that measures the ecosystem or Takiwā as a whole.

The Motueka Cultural River Health Index (Environs Holdings Ltd and Te Uri o Hau Settlement Trust, 2011) is an example of using the Ngā Atua domains framework. Tiakina Te Taiao, a kaitiaki group from the Motueka catchment used a Ngā Atua domains framework to organise indicators based on the Cultural Health Index from Tangaroa (estuarine and river ecosystems) to Tāne-mahuta (terrestrial ecosystems) for a ki uta ki tai approach (Table 1).

Table 1 List of the Motueka Cultural River Health Index indicators categorised using the Ngā Atua domains framework.

Atua Domain	Indicator
Tangaroa (atua of the seas, rivers and lakes)	water clarity, water flow, water quality, shape and form of river, riverbank condition, sediment, insects, fish
Tāne-mahuta (atua of the forests and birds)	riparian vegetation, catchment vegetation, birdlife (species), taonga and pests
Haumia-tiketike (atua of wild or uncultivated foods)	mahinga kai (mahinga kai score), rongoā (traditional medicine)
Tūmatauenga (atua of war and people)	human activity/use of river, access (mahinga kai score), cultural sites
Tāwhiri-mātea (atua of wind and air)	smell
Rongo-mā-Tāne (atua of peace, harvested resources)	cultivated food (mahinga kai score)

Indicators are assigned a score from 1-5 and then averaged to calculate a cultural stream health measure and mahinga kai score. The aim of this process to provide a Māori perspective to the state of the environment using mātauranga Māori.

3.2.4 Mauri of the Waterways Outcomes and Indicators Tool Kit

The mauri of waterways outcomes and indicators tool kit (Nelson and Tipa, 2012; Jefferies and Kennedy, 2009) is intended to provide tangata whenua with a tool to evaluate whether the mauri of waterways within their rohe is in good health, and to understand the contribution councils and Crown agencies make in achieving this goal.

There are several outcomes aimed to be achieved by this framework. For Māori these include the ability to assess the condition of the environment in terms of the Māori values mana, mauri and tapu, and the extent to which councils and other parties contribute to this. For councils the outcomes and indicators kete will present Māori aspirations and a Māori world view to staff and decision makers using these tools, as well as providing a practical understanding of aspects of kaitiakitanga. It also aims to allow councils to assess their performance over time and against neighbouring and other councils.

This tool kit provides worksheets developed by Māori researchers with experience in environmental resource management and planning and policy writing, which can be used by council staff and tangata whenua to collect information and work towards fulfilling the objectives.

The worksheets can be used in a purpose-specific way where instead of using the whole kete, tangata whenua or councils can use indicators that relate to a specific topic or area of interest. For example, a purpose-specific use by iwi may be evaluating council plans, policies and practices and testing whether these reflect tikanga Māori, and Māori environmental values and goals. An example of a purpose-specific use by Council may be evaluating Council policies and practices in order to better understand and provide for mātauranga Māori and kaitiakitanga, thereby helping to build bridges of understanding.

The three kete listed are named according to the tikanga on which they are based. They are essentially measured by indices and associated indicators. The indicators are based on a series of questions and descriptive statements (called measures) ranked at numerical levels. An evaluation worksheet is then provided at the end where the scores from the indicators are added up and an overall score for each index is calculated. While it may seem complex in context, the worksheets provided by Jefferies and Kennedy's (2009) are straight-forward and are easily used by both tangata whenua and councils.

Kete 1: Mana and Mana whenua

As kaitiaki, Māori have a responsibility to define themselves in terms of their ancestral lands, and they need to preserve it in a way that is meaningful to them. The term mana whenua commonly refers to the authority tangata whenua have over their lands and tribal mana is considered to be diminished where Māori fail in their duty as kaitiaki of ancestral lands (Jefferies and Kennedy 2005). The outcome of this kete is that mana whenua is appropriately respected and this can be measured through three indices and their associated indicators (example in Table 2).

Table 2 List of indicators associated with one of the three indices in the Mana Whenua Kete from the Mauri of the Waterways outcomes and indicators tool kit.

Index	Indicators
1. Extent to which Local Authorities acknowledge Mana Whenua	Whether respondent agrees that local Authority acknowledges mana whenua.
	Extent to which iwi/hapū tribal boundaries are known to Council.
	Whether Statutory Plans recognise and provide for mana whenua.
	Extent to which Council monitoring has determined whether Anticipated Environmental Results (AERs) relating to mana whenua provisions have been achieved.
	Extent to which Council provides for mana whenua input into decision making.

Kete 2: Mauri and the Mauri of Waterways

Mauri is often defined as the life-force of an object (living or otherwise). All things in Te Ao Maori are considered to have mauri and the maintenance and protection of mauri for any waterway is a critical responsibility for kaitiaki. The outcome of this kete is that mauri of all waterways are in optimum health, which is measured through five indices and their associated indicators (example in Table 3).

Table 3 List of indicators and measures associated with one of the five indices in the Mauri of Waterways Kete from the Mauri of the Waterways outcomes and indicators tool kit.

Index	Indicators and measures
5. Physical evidence that mauri is protected	Whether respondent agrees that mauri Is protected (measure of level of agreement)
	Characteristics of the water (safe to drink, water clarity, scum/foam visibility, taste, smell, feels oily, sediment/slime on riverbed)
	Characteristics of the waterway and its immediate environment (presence of stock in margins and waterway, riparian vegetation, plant species within margin, river flow)
	Characteristics of waterway inhabitants (fish species abundance, diversity and health)
	Presence of potential human threats (withdrawal of water from waterways, incidence of point or non-point discharge)

Kete 3: Tapu and Wāhi Tapu

Tapu is regularly translated as untouchable, sacred and associated with the gods. The protection of wāhi tapu is of utmost importance to tangata whenua. The outcomes and indicators included are intended to provide a series of tools for both the evaluation and protection of tribal wāhi tapu. The outcome of this kete is that wāhi tapu are protected, which is measured through four indices and their associated indicators (example in Table 4).

Table 4 List of indicators and measures associated with one of the four indices in the Wāhi Tapu Kete from the Mauri of the Waterways outcomes and indicators tool kit.

Index	Indicators and measures
4. Extent to which wāhi tapu are identified and protected	Whether respondent agrees that wāhi tapu are widely identified and protected (measure of level of agreement)
	Physical characteristics of wāhi tapu (condition, level of permission for the site to be modified)
	Characteristics of immediate environment (whether site location is publically or privately owned, description of immediate environment)
	Presence of threats (type of threat, whether use of the sites is consistent with tikanga, level of statutory protection for the site)

3.2.5 Te Mauri Model

Te Mauri Model (Nelson and Tipa, 2012; Hutchings et al, 2017; Rehu and Morgan, 2012) is based on the ability to understand the interconnectedness of all living things and to measure sustainability in a holistic manner. Originally developed for engineering purposes, it can be adapted for use in freshwater decision-making processes, improving resource management by integrating Te Ao Maori values and knowledge into western models of sustainability.

The Mauri Model assesses impacts of anthropogenic activities on the mauri based on indicators from four domains (ecosystem, cultural, community and economic) each weighted differently depending on the project or activity and the people that are involved. Performance indicators (at least three) for each domain are scored individually (-2 to +2), weighted (depending on the environment) and then given a final score. The indicators (Table 5) can be rated on an integer scale from -2 (denigrated), -1 (diminishing), 0 (maintaining), +1 (enhancing) to +2 (fully restored). This may also be known as the Mauriometer or the Mauri Barometer Assessment.

Table 5 List of possible indicators for the Te Mauri Model regarding freshwater ecosystems. Derived from http://www.mauriometer.com/DataEntry/index

Domain	Ecosystem	Cultural	Community	Economic
Associated Indicators	Impact on waterways	Inclusion of local knowledge	Fishing	Implementation cost
	Indicator species biodiversity	Kaitiakitanga	Layout	Maintenance cost
	Riparian Margins	Mahinga kai	Private land use	Repair costs
	Water Quality	Resource gathering	Public health	Water outfall
	Pollution levels	Sacred and spiritual places	Aesthetic appeal	Industrial water use
	Impact on flora and fauna	Traditional knowledge	Fishing	Eco-tourism
	Nutrient loss from catchment	Traditional rituals	Employment	
	Life supporting capacity of water		Access	

3.2.6 The Mauri Compass

The Mauri Compass (Hutchings et al. 2017), designed by Te Rūnanga o Turanganui a Kiwa and Gisborne District Council (GDC), is used to assess and restore the mauri of the region's waterways. GDC worked with iwi scientists to develop the Mauri Compass to help quantify and visualise mauri in a way that can be integrated with management and used in policy and planning. Mauri is a key value for freshwater in the Gisborne region and the mauri compass tool is a good example of a tool at the interface of Māori knowledge and western science.

The tool assesses the mauri of a waterway using 12 compass points (indicators), each rated between 1 and 5. Compass knowledge and its attributes are stored inside the three kete of tangata whenua (people), tane (land) and tangaroa (water), enabling a ki uta ki tai approach.

The attributes are; tangata whenua, wairua, mahinga kai and cultural, habitat, biodiversity, water biology, water chemistry, tuna growth rates, tuna species, tuna abundance and population and tuna biological health and can be rated through questions developed by the effected tangata whenua and resource managers (example in Table 6).

Table 6 Example of potential/typical questions for each indicator regarding freshwater from "The Mauri Compass by Ian Ruru. "

Compass Point/ indicator	Typical Question for a River
Tangata Whenua	How strong are the people's connections with the river?
Tikanga	How prevalent are the cultural practices with the river?
Wairua	How strong are the spiritual connections with the water?
Biodiversity	How diverse (bugs, birds and fish) Is the river life?
Chemistry	How chemical free is the river?

3.2.7 Wai Ora Wai Māori Tool

The Wai Ora Wai Māori tool provides a robust, holistic and complementary data set when used alongside scientific measures (Awatere et al. 2017). Landcare Research recommends that institutions developing plans and policies for improved freshwater management use this tool to improve collaboration, and to identify key attributes and measures that are meaningful and relevant to iwi/hapū groups.

Developed over several years but more recently refined and tested in the Waikato Region collaboratively with Waikato-Tainui researchers and a technical advisory group, the Wai Ora Wai Māori tool provides qualitative and quantitative measures for stated attributes consistent with the NOF standards. This tool aims to identify measures that demonstrate the holistic nature of Te Ao Maori and mātauranga Māori.

The structure of the tool can be tailored by any other iwi/hapū/kaitiaki group wanting to apply their own values and attributes, however this tool currently identifies values important for the Waikato-Tainui rohe. These values include mahinga kai, whakapapa, whanau, kaitiakitanga and mauri and are categorised under three main domains; biophysical, community connectedness and metaphysical.

Under each domain are two attributes (example Table 7) and the scales for these attribute states are consistent with those of the NOF where they are rated on a scale form 1-4 (or A to D).

Table 7 List of attributes under the three domains chosen by tangata whenua in the Waikato-Tainui rohe for the Wai Ora Wai Maori Tool.

Domain	Attribute
Taha Kikokiko (physical or biophysical)	Kai is safe to eat
	Kai has a strong whakapapa
Taha Whanau (social)	Whanau satisfaction
	Kaitiaki are effective
Taha Wairua (metaphysical or spiritual)	Condition of mauri
	Condition of kaitiaki/tipua/taniwha

3.2.8 The Waikato River Pilot Report Card

Currently a roopu of five representatives from Waikato River Iwi are developing a report card that measures the state of cultural health and wellbeing indicators. The Waikato River Report Card is designed to communicate the state of the cultural, social, environmental and economic health and wellbeing of the catchment. The report card has a holistic monitoring approach and combines mātauranga Māori and western science. The report card is divided up into 8 themes called taura, that are considered to be key elements of importance to Waikato communities with regard to the awa, and for guiding its restoration. These can then be broken up into subgroups and each of these have their own indicators (examples in Table 8). The taura are then given a grade A-D, aligning with the NOF.

Table 8 Taura and examples of associated indicators of the Waikato River Pilot Report Card.

Taura	Sub Groups/Indicators
Kai	Fisheries and kai (e.g. tuna, whitebait)
Water Quality	Water quality (e.g. clarity, nutrients)
Sites of Significance	Sites of Significance (e.g. waahi tapu, place names, historic sites)
Ecological Integrity	Ecology, biodiversity, physical character
Experience	Access, human health (e.g. contaminants), contact recreation (e.g. E.coli), rubbish, intergenerational response, information/enabling tools, education.
Water Security	Water allocation/flow, efficiency and use, environmental flows and hydro ramping
Economics	Economics (e.g. GDP)
Effort	Effort in restoration (e.g. money invested)

3.3 Other Scientific Monitoring Tools

3.3.1 The Stream Health Assessment Kit (SHMAK)

The Stream Health Assessment Kit (SHMAK) is a tool that monitors and assesses flow and catchment conditions, habitat quality (flow velocity, water pH, water temperature, water conductivity, water clarity, composition of the stream bed, deposits, and bank vegetation) and stream bed life

(invertebrates and periphyton/algae). Currently the kit is being used by the Taranaki Regional Council education/freshwater staff (Environmental Science – Freshwater staff) to educate and build an awareness of scientific measures of stream health to iwi/ hapu and schools within the Taranaki region. While the kit does not directly take into account any form of cultural monitoring it can be used to compare traditional knowledge on stream health to the western science view. Some iwi have purchased the SHMAK kits for their water monitoring programmes.

3.3.2 Stream Habitat Assessment Protocol (SHAP)

The Stream Habitat Assessment Protocol (SHAP) is a set of practical, cost-effective and standardised protocols for the assessment of physical habitat in New Zealand waterways. These protocols were produced in response to a request by regional councils to provide guidelines and preferred methods for the assessment of physical habitat conditions within stream and river systems. Physical habitat is the living space for all in-stream flora and fauna and sets the background for any assessment of the health of a waterway. SHAP assesses habitat parameters such as hydrology and morphology, the channel cross section, the longitudinal channel, the in-stream habitat, and riparian cover and vegetation.

3.4 Monitoring in Taranaki

As noted earlier European settlement and agricultural development (land clearing) has had a dramatic impact on the environment in Taranaki and elsewhere in New Zealand. Quantitate environmental monitoring commenced in Taranaki in the 1970s by government ministries when much of the agricultural development had occurred. The Taranaki Catchment Commission, the first processor of the TRC, was formed in April 1970 and had meagre resources. So there is limited historical quantitative data and none on pre European environmental conditions. However, qualitative data is available from tangata whenua and this is an important part of mātauranga Māori.

There are many programmes and tools the Taranaki Regional Council currently use to monitor the environment in the region. The SHMAK tool is being used by the Council and iwi across the Taranaki region to monitor stream health. This has enhanced the relationship between tangata whenua and the Council.

The current State of the Environment Monitoring (SEM) programmes carried out by the Council and associated indicators are discussed below. It is not possible to have SEM monitoring sites on every river, and sites have been selected to reflect representative areas in the region. SHAP is used at every site monitored.

The Freshwater Macroinvertebrate Fauna Biological Monitoring Programme is used to report on ecological health for SEM. This is assessed using the Macroinvertebrate Community Index (MCI), a tool that scientifically assesses stream health which was developed in this region. There are 59 sites where this monitoring is carried out with their location and iwi boundaries shown in Figure 1. The NPS-FM has required, as a minimum, that councils include the MCI in their freshwater monitoring. Specific equipment and access to laboratory facilities are integral to the MCI process, therefore restricting its use to researchers and some resource managers.

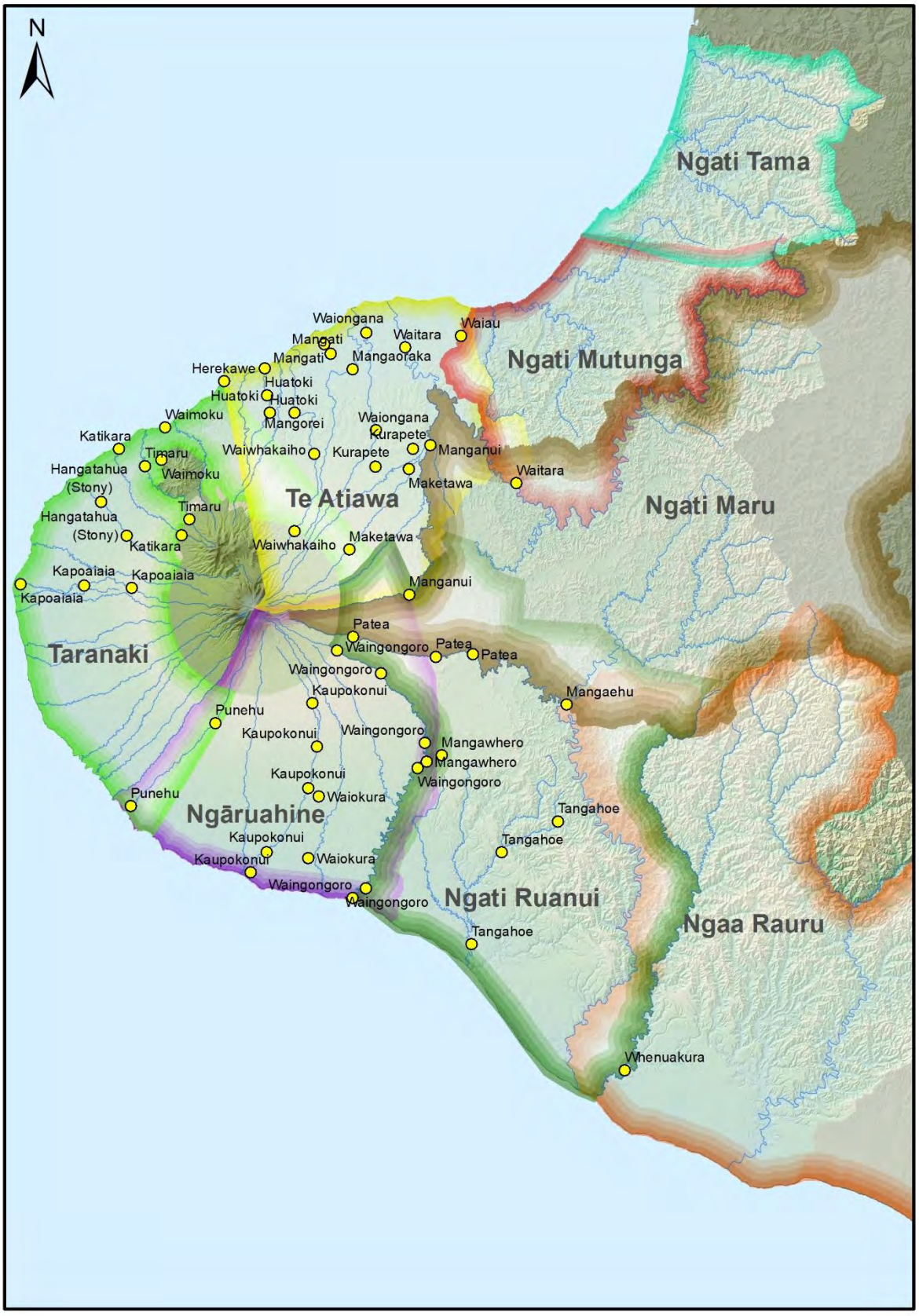

Figure 1 MCI SEM sampling locations and iwi rohe boundaries .

The Freshwater Physiochemical SEM Programme is used to monitor the physical and chemical state of freshwater for SEM. Measures include water clarity, conductivity and acidity (pH), nutrient levels, dissolved oxygen levels (DO) and the amount of oxygen consumed in the breakdown of organic matter (BOD). Also included in the physiochemical programme is the monitoring of concentrations of faecal contamination indicator bacteria such as E. coli. The current SEM monitoring sites for the Freshwater Physiochemical Programme are displayed in Figure 2 with iwi boundaries.

Taranaki Regional Council is currently working towards developing a SEM programme for freshwater fish. Currently, it is proposed that only regionally distinct species will be surveyed, including brown mudfish, three kokopu species, koaro, lamprey, inanga and the longfin eel. This programme is in the early stages of implementation, with some sampling sites yet to be confirmed.

The flora in riparian zones is well understood, particularly where planting has occurred under Council riparian plans. Fauna in riparian zones was studied which demonstrated the good succession promoting development of riparian plantings, with increases in native plant species richness, vegetation cover diversity and structural complexity (Krejcek 2009).

Compliance monitoring of resource consents is an important role for the Council to determine the effects of activities on land and water. Inspections and sampling are carried out as a part of these comprehensive monitoring programmes and results presented to the community.

The Taranaki Regional Council also has a comprehensive Riparian Planting Management Programme used to maintain and improve water quality. Riparian zones filter nutrients, sediment and bacteria that leave the land as run-off, and shade streams. The Council's working with land owners to ensure all Taranaki streambanks are protected by riparian (streamside) fencing by 2020.

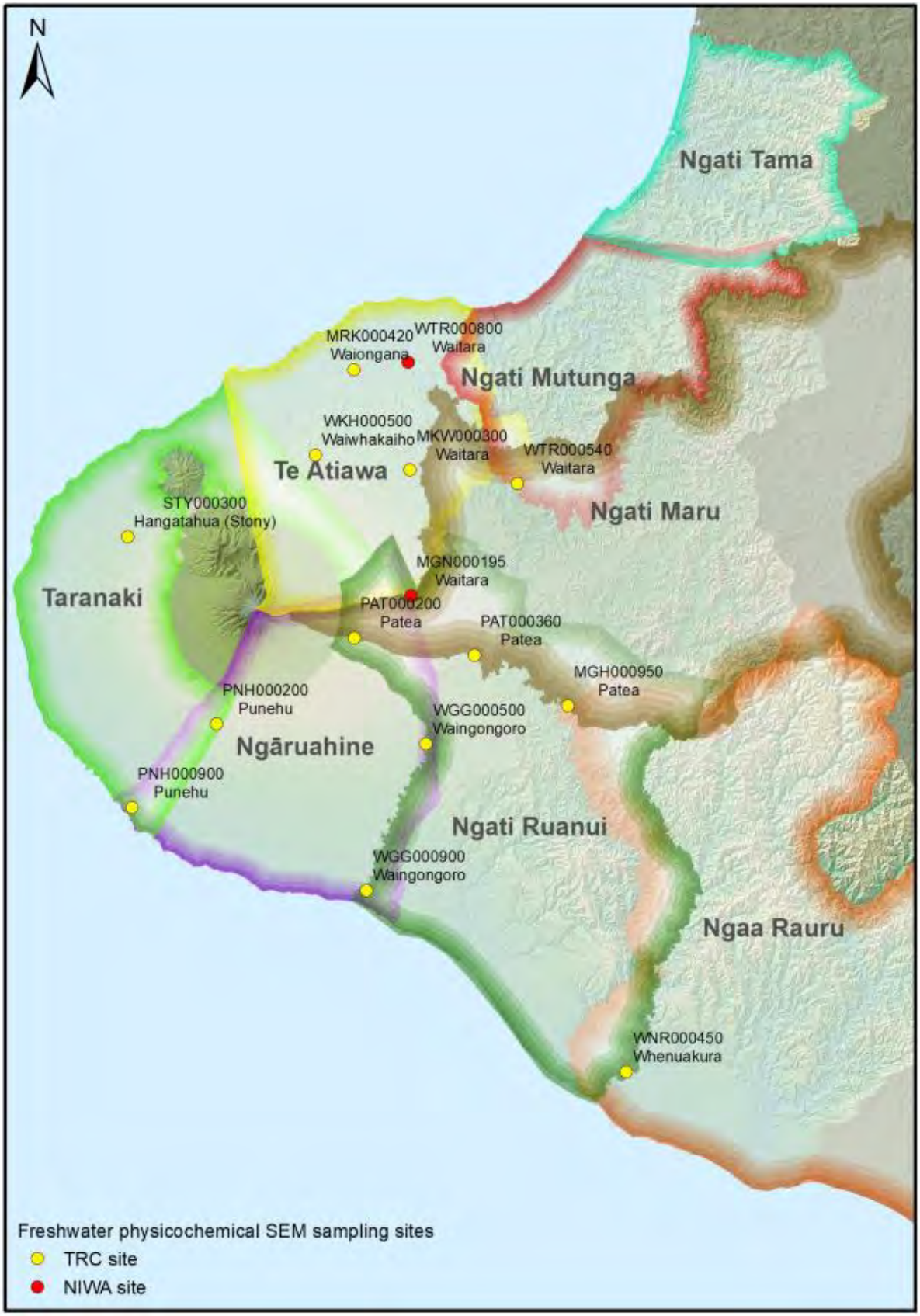

Figure 2 Location of the Freshwater physiochemical SEM sampling sites and iwi rohe boundaries.

Under the NPS-FM, Councils are required to group their regional waterways into Freshwater Management Units (FMU). Councils are then required to work on setting objectives, limits and other management measures for these FMUs and develop a monitoring plan that incorporates mātauranga Māori. This is to avoid unnecessary complexity and keep management efficient and cost-effective. Taranaki's proposed FMUs (in the Draft Freshwater and Land Management Plan for Taranaki) are to divide the catchments into four units, based on shared values, land use and physical characteristics (Table 9). Figure 3 shows a proposed map of these FMUs.

Table 9 Table of the proposed Freshwater Management Units from the Draft Freshwater and Land Management Plan for Taranaki.

Unit A- Outstanding freshwater bodies	Hangatahu (Stony) River and Maketawa catchment, immediately upstream of but excluding the Ngatoro Stream catchment, Lake Rotokare Scenic Reserve
Unit B- Waterways on Mount Taranaki and the ring plain	Land is farmed intensively. Catchments are small and subject to relatively high consumption and waste discharge pressures due to dairy and urban land use. Catchment water flow rise and fall rapidly in response to rainfall.
Unit C- Waterways on the northern and southern coastal terraces	Land is farmed intensively with a greater demand for irrigation. Southern coastal terraces have predominantly short, small spring-fed streams that discharge over the coastal cliff. Northern coastal terraces include lower reaches of rivers which are subject to large tidal ranges and naturally high sediment loads
Unit D- Waterways in the eastern hill country	Land predominantly used for dry stock farming and plantation forestry. Waterways are typically deeply incised rivers fed by short, steep tributaries and have a branchlike drainage pattern which, as a result of the steep easily erodible geology, generally carries a high load of sediment.

It is important to acknowledge that Taranaki Regional Council are not the only regulatory authority involved in freshwater management. There are other organisations such as the Ministry for Primary Industries (MPI) and Department of Conservation (DOC) who impose regulation and monitoring obligations on the management of freshwater fisheries. For example, MPI manages the tuna and whitebait fisheries while the Council is responsible for the protection of their habitats. Further the Council as well as DOC have specific responsibilities to manage fish passage in our waterways under the Freshwater Fisheries Regulations 1983 (Fisheries Act 1983).

Figure 3 Proposed Freshwater management units for the Taranaki region in the Draft Freshwater and Land Management Plan.

3.5 Summary of Monitoring Tools

This section has discussion on some monitoring tools identified above that are being used to incorporate mātauranga Māori into freshwater monitoring in New Zealand. These tools have included mātauranga Māori in the form of Māori indicators (both qualitative and quantitative) and in the form of using mātauranga Māori to fill knowledge gaps (such as in the State of the Takiwā). The Ngā Atua domains framework also gives an example of incorporating mātauranga Māori by categorising western science indicators into a Māori framework. It is important to note here, that these tools cannot be directly used in the Taranaki Region, as the tools are more specific to the area and people that they were developed for.

However, there are common themes and indicators represented across the frameworks and monitoring tools discussed that provide for mātauranga Māori in freshwater monitoring. These indicators could form a framework and the basis of discussions with iwi authorities in Taranaki when developing a monitoring plan. Some of these indicators important to Māori also link with those indicators of importance to western science. Hence in an attempt to synthesize Māori indicators with those of western science, the quantitative western science measures are used as potential indicators of Māori values.

As noted in section 3.4, the Council is one of many regulatory agencies that have freshwater responsibilities and who undertake monitoring. For example, the Council, under the RMA, is responsible for the habitat of flora and fauna while MPI are responsible for freshwater fisheries management (quota system). Therefore, some Māori indicators can potentially be measured by monitoring that is already being conducted by the Council and by other environmental monitoring organisations in New Zealand (Table 10).

Table 10 Table synthesizing common Māori freshwater indicators found in the tools studied, with current Taranaki Regional Council freshwater indicators and how TRC monitors/has a role in effecting the indicators. Other monitoring statutes involved are also included.

Māori Value	Existing Māori indicators	Western science indicators that link to/represent Māori indicators	TRC monitoring/role	Other statutes monitoring and roles
Kaitiakitanga and whakapapa	Role passed down through generations	Consent conditions, compliance monitoring and enforcement	Consent authority Iwi reps. on TRC planning and regulatory committees Consultation process with iwi	
Mauri (physical) and condition of mauri	Water clarity	Suspended solids Turbidity	SEM	
	Water flow	Water flow	SEM Consultation process with iwi	
	Scum/foam	Visual/photo	Recorded in field as a comment	

Māori Value	Existing Māori indicators	Western science indicators that link to/represent Māori indicators	TRC monitoring/role	Other statutes monitoring and roles
	Oily	Visual Hydrocarbon sheen Natural hydrocarbon sheen Natural Iron oxide in the water	Compliance monitoring of consents Recorded in field as a comment	
	Smell	Odour	Recorded in field as a comment	
	Taste			
Mauri, Mahinga Kai	Mahinga kai diversity Mahinga kai abundance	Surveys of Tuna, Inanga, Piharau, Ika Surveys of Koura, Kakahi, Porohe,	Fish Monitoring Programme (surveys kokopu, piharau, koaro, inanga and tuna) Compliance monitoring of fish passes Wetland and riparian programme monitoring Compliance monitoring of fish passes	DOC native fish requirements (Fisheries Act 1983) MPI commercial eel and other species quota
Kai is safe to eat	Mahinga kai health & Mahinga kai habitat	Water temperature Suspended sediment Substrate type Water flow pH DO and BOD5 Nitrate Ammonia Invertebrates E. coli	SEM MCI (as a general stream health monitor) SEM fish distribution monitoring SHAP	
	Other taonga species (watercress, harakeke)		Riparian programme farm inspections for harakeke (and watercress)	

Māori Value	Existing Māori indicators	Western science indicators that link to/represent Māori indicators	TRC monitoring/role	Other statutes monitoring and roles
	Pest species	Surveys of catfish, koi carp, trout Monitoring of invasive plant and algae species	Biosecurity Plans (didymo) Limited SEM for invasive species	Biosecurity Act
	Riparian vegetation Stock access	Riparian planting and fencing	Riparian Planting Programme (GIS) Compliance monitoring and enforcement SHAP	
	In-stream structures	Fish passages Biodiversity	Consents Orphan structure programme	DOC Fish passage management (Fisheries Act 1983)
	Channel modification	Composition of the stream bed Water flow Habitat	SEM Compliance monitoring (for culverts and fords)	
	Treated waste discharges	Point source discharges	Compliance monitoring of consents Permitted activities	
	Other discharges	Non-point source (indication from Ammonia, E.coli, Suspended solids, BOD5)	SEM Riparian Planting Programme Pollution incident response and investigations	
Mauri (spiritual), cultural sites	Access to traditional sites	Identify sites Access by agreement with land owner		
	Access to mahinga kai sites	Identify sites Access by agreement with land owner		
Ki uta ki tai- connection between mountain and sea, holistic approach	Variety of plants and animals in their natural environment (biodiversity)	Fish passage Water flow Riparian plants Flora and fauna	SEM Orphan structures programme Biodiversity programme	

Māori Value	Existing Māori indicators	Western science indicators that link to/represent Māori indicators	TRC monitoring/role	Other statutes monitoring and roles
	Catchment land use	Sediment Nutrients (MCI) Land use categories	SEM MCI GIS	

4 Conclusion

Mātauranga Māori is a form of indigenous knowledge based on long-standing interactions through space and time between people and their surrounding environments. Mātauranga Māori can be represented through values, concepts, protocols, places and names and is passed down through generations.

To give effect to the NPS-FM and successfully incorporate mātauranga Māori into freshwater monitoring and decision-making, the Council should take into account tangata whenua values and develop appropriate policies, rules and a monitoring tool that reasonably reflects those values using western science provisions.

Māori values important to freshwater include kaitiakitanga, tikanga, mana, and whakapapa. These can be represented through the mauri of a waterway, mahinga kai and mahinga kai sites, taonga species and traditional sites such as wāhi tapu. From the mountains to the sea - ki uta ki tai is another important concept. Mātauranga Māori however, is a sensitive topic and is very iwi specific.

For the Council to obtain an accurate representation of the values of tangata whenua in Taranaki, it needs to engage with the eight recognised iwi. This can be done through a tikanga-based framework (Section 3.1.1). Many regions in New Zealand, such as Southland, Otago and Waikato, are already collaborating with kaitiaki groups that represent the iwi in their rohe. These groups come up with values and aspirations to present to the Council when they are developing policies and making decisions. While these collaborative processes can be highly beneficial in the long term, they are expensive and lengthy.

In order to develop a freshwater monitoring plan that incorporates mātauranga Māori, Council need to identify how Māori in the Taranaki region determine the quality of a waterway and the indicators that assess this. This can be done through engagement with individual iwi. Monitoring tools already developed by kaitiaki groups and resource managers have used mātauranga Maori alongside western science to reflect the values of the iwi/hapū of their region. These tools present common indicators between them (Table 10) and can form the basis of discussions with iwi in Taranaki when developing a monitoring plan incorporating mātauranga Māori. Presenting a foundation of options for discussion would be efficient for all involved.

To give effect to all mātauranga Māori related objectives and policies in the NPS-FM, and from the information in this report, including what other councils are doing to incorporate mātauranga Māori and the monitoring frameworks and tools that can do this, the following recommendations are made for consideration in the development of a mātauranga Māori monitoring programme. That the Taranaki Regional Council:

1. Takes into account mātauranga Māori related objectives in the NPS-FM when reviewing the Regional Fresh Water Plan, and works with iwi authorities on developing a monitoring plan that reflects Māori values and uses western science provisions.

2. Continues training and collaborating concerning SHMAK, to improve tangata whenua understanding of scientific knowledge, Council understanding of mātauranga Māori. .

3. Uses the findings of this report, particularly the common indicators found across the tools, as a baseline for discussion with iwi when developing a monitoring tool that incorporates mātauranga Māori.

NB: From the Policy and Planning Committee meeting on the 13th March 2018 the recommendations for the agenda item were amended to the following and the report is to be titled "Draft internal report".

Recommended

That the Taranaki Regional Council:

1. receives the memorandum Draft internal report on incorporating mātauranga Māori into monitoring of freshwater in Taranaki.
2. agrees to initiate consultation with iwi on developing a freshwater monitoring plan incorporating mātauranga Māori.

5 Glossary

Atua - god.

Awa - river

Hui - meeting, gathering.

Ika - fish.

Kaitiaki - guardian, caregiver.

Kaitiakitanga - guardianship.

Kaumātua - elderly.

Kete - bag.

Ki uta ki tai - from the mountains to the sea.

Koura - freshwater crayfish.

Kotahitanga - unity, togetherness.

Mahinga kai - food gathering place, wild food that is harvested.

Mana - courage, spiritual power, authority.

Mana whenua - territorial rights, power from the land.

Manaaki - to support, take care of, give hospitality to.

Manaakitanga - hospitality, kindness, support.

Manuhiri - guests.

Mauri - life force, essential quality and vitality of a being or entity, life supporting capacity of an object (both spiritually and physically).

Moko - grandchildren, great - grandchildren.

Ora - to be well, healthy.

Piharau - lamprey.

Rohe - region, territory, boundary.

Roopu - group, committee, organisation.

Takiwā - area, region.

Tangata whenua - local people, people of the land.

Tangihanga - funeral, rituals for the dead.

Taonga - treasure, valuable item.

Taura - rope, string.

Te Ao Maori - the Maori worldview.

Tikanga - protocol, correct procedure.

Tino rangatiratanga - self - determination, sovereignty.

Tuku iho - inherited, handed down.

Tuna - eel.

Wāhi taonga - treasured sites (e.g. marae, kainga).

Wāhi tapu - sacred place, sacred site (e.g. urupa).

Wai - water.

Waiata - song.

Wairua - spirit, soul.

Whaikorero - formal speech.

Whaitua - region, area.

Whakapapa - genealogy, ancestry, lineage.

Whanau - family.

Whānaungatanga - relationship, sense of family connection.

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