Background to the development of mahinga kai and Māori use outcomes for the draft Natural Resources Plan for the Wellington Region

Leana Barriball and Caleb Royal

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1. Introduction

The purpose of this report is to explain the approach taken in developing, and rationale for, the narrative outcomes that relate to mahinga kai and Māori use values applied in the draft Natural Resources Plan (dNRP) as part of the plan's shared values approach. It also identifies issues raised or occurring as a result of this approach and highlights where further work could be undertaken.

The report is a result of participation by the authors in the Limits Setting Advisory Group (LSAG) initially set up in December 2012. The purpose of the LSAG was to develop regional outcomes and identify appropriate indicators for a variety of values held by the community. This would provide the basis for whaitua committees to determine and set catchment-appropriate limits. This was initially approached through the use of the objectives cascade developed by the Ministry for the Environment (MfE).

The objectives cascade (see example in Appendix 1) begins with a value held by the community. From this value, a broad narrative objective was determined. This was then defined further to tight narrative objectives. From the tight narrative objectives, measurable indicators[1]were identified. Finally, selected measurable indicators were recommended for inclusion along with numeric outcomes that represent a 'fair to good' state[2]. Although the intention was for all outcomes to be numeric, narrative outcomes were recommended in the absence of tested and accepted numeric outcomes for the values *aquatic ecosystem health and mahinga kai* and *contact recreation and Māori use*.

1.1 Māori values

Tangata whenua identified mauri as the foundation value when considering the health and wellbeing of fresh and coastal waters. There are many values that support mauri and the dNRP has identified that the supporting values that will be managed for within the plan are mahinga kai and Māori use.

The ability for tangata whenua to engage in mahinga kai and Māori use activities requires the mauri of the area to be in a state which does not cause potential harm to those people and provides for the sustainability of resource use in a particular area.

The activities and interactions that Māori have with fresh and coastal waters are diverse. They have been the supermarkets, the play-centres, the transport network, the fridge or freezer, the pharmacy, the classroom, the church and the bathroom. The mauri of the waters must support all interactions and the relationships Māori have with their waters.

The values of mahinga kai and Māori use are used to provide for the relationship Māori have with fresh and coastal waters. These values sit alongside aquatic ecosystem health and contact recreation respectively as a way of providing for two different value systems. This means that some attributes (referred to as indicators in the introduction above) and outcomes will only provide for ecosystem health, or only mahinga kai, or in some instances they may provide for both. The approach of using a

[1] These are now referred to as attributes since the release of the National Objectives Framework (NOF).

[2] The 'fair to good' state is a relative state of health taking into account regional conditions. This does not relate to NOF bands for water quality attributes.

variety of attributes and associated outcomes allows us to ensure that the environment is managed to accommodate both value systems.

2. Narrative outcomes for mahinga kai and Māori use

Given the same values are applied across the region and to each water body type, the narrative outcomes for mahinga kai and Māori use were also applied consistently to each water body type:

- Mahinga kai: Taonga species are present in quantities, sizes and of a quality that is appropriate for the area, and are safe to eat[3].

- Māori use: Waterbodies are safe for primary contact and support Māori use.

There was a lot of time spent on defining succinct and precise wording for the narrative outcomes as they are used to encompass all aspects of the values mahinga kai and Māori use.

2.1 Mahinga kai

The word taonga was used to encapsulate species that are either harvested or caught for consumption or other purposes, or have a significant impact on species that are harvested or caught for consumption or other purposes. The use of the word taonga links back to the Resource Management Act 1991 (RMA) and Te Tiriti o Waitangi. Its use is deliberate as Māori are responsible for determining what is considered a taonga of their fresh and coastal waters. For this reason further work will need to be conducted with whānau, hapū and iwi to determine what taonga are (or should be) present in each whaitua. It is difficult to create a general list of taonga for the entire region as they may differ significantly between catchments. However, a generalised list is included as Appendix 2 to provide an example of taonga species.

Due to the health implications for people, the quality of species used for consumption needs to be managed. The impact that people may have on the population due to harvesting should also be monitored and taken into account when reporting against the narrative objective. The words ”appropriate for the area” were identified to account for the variation in quality of sites for a particular species. For example you would not typically expect a multitude of large long-fin tuna to reside in the lower reaches of a catchment but you would in the upper reaches.

Although mahinga kai activities are conducted in certain areas, taonga species may temporarily inhabit other waterbodies within the catchment and will thus need to be managed. For example, some species utilise wetlands as migratory paths and/or as nurseries.

2.2 Māori use

Primary contact is when users are in direct contact with water and are likely to be fully immersed in or swallow the water, whereas secondary contact may involve direct contact but full immersion or swallowing of the water is unlikely. Māori use comprises activities which involve primary contact and includes swimming, walking

[3] This narrative outcome is applied to all water body types with the exception of groundwater (not applicable as mahinga kai is not collected from groundwater) and wetlands, where the narrative is slightly altered and states “Sustainably harvestable populations of mahinga kai species, in quantities, sizes and of a quality that is appropriate to the area, are present in or are migrating through the wetland”.

in the water, paddling, tohi rites (baptism or dedication), whakahaere (cleansing from grief), rāhui (the active placing of restriction), whakanoa (removal of tapu) and food storage or gathering. Providing for this value means users being reasonably safe from risks presented by polluted water. For example, a parent should feel safe that if their toddler gulps down a mouthful of water while bathing in the local river they are unlikely to contract a serious illness.

Māori use also encompasses activities that utilise other aspects of the water and surrounding habitat. This may include indirect contact with the water such as walking along the beach, being in close proximity to the water, collecting materials such as Harakeke or rongoā, or it could extend beyond any physical contact for example the use of waterways for food storage such as kāngawai (fermented corn). Māori use in this context also refers to species or material that are important to tangata whenua for values such as wairua (spiritual health), whānau (family health), hinengaro (mental health) and/or Tinana (physical health), or it can also extend to the actual space and the aesthetic environment.

The spiritual connection that Māori have with water or the surrounding area may mean that expectations of water quality in certain areas are high. For example there may be a requirement for areas used for whakanoa are required to have no traces of faecal matter or other contaminants, human or animal.

An area not considered in the generation of the outcomes for the value contact recreation and Māori use, is the fact that tangata whenua have used rivers, streams and puna (springs) as the primary source of drinking water. It is unreasonable to expect untreated water to comply with the drinking water standards set by the Ministry of Health (MoH, 2005) . However, it is worth noting that this could be used as a test to determine the state of the mauri. Waterbodies with a healthy mauri should be able to be consumed without fear of becoming seriously ill.

2.3 Difficulty in fitting Māori values in a non-Māori framework for environmental management

The challenge of incorporating Māori values into a non-Māori framework, such as that presented by the development of the dNRP which has a prescribed process and regulatory outcomes, is difficult. This challenge is nothing new but it requires that those tasked with implementing the plan be willing to approach problems with a fresh set of eyes, and accept that different values create different ways of observing the world. The Māori world view requires an open mind, and to exercise thoughts that are not constrained to only scientific evidence. For example, Māori live in a world where spiritual forces are constantly present, and trusting intuition or inherited knowledge is a concept that is accepted and ingrained.

Māori take a holistic approach to caring for the environment, thus it is to be expected that there will be overlap between values and objectives. As an example, tangata whenua may go out to the beach for the particular purpose of harvesting pipi, an objective that would definitely fit under the aquatic ecosystem health and mahinga kai value. However, to gather pipi one would have to wade in the water and get wet, and may go swimming at the same time. Swimming in clean water would be an objective set under the contact recreation and Māori use value. Most do not go out for one purpose only. Recreation, food gathering, knowledge sharing and monitoring the health of the environment is often done at the same time and adds to the depth of

knowledge gained by Māori in this way. It has been especially difficult to separate mahinga kai from Māori use because the two activities overlap so much. For example because mahinga kai includes the act of fishing or harvesting it could also be described under Māori use. Therefore, mahinga kai outcomes will consist of some that may seem like they should sit under Māori use and vice versa.

Within a Māori world view interrelationships with the physical river habitat is not confined to the water or the bed, but includes all things around it. This is especially evident with riparian vegetation. The trees, fish, rocks, sediment, sky, bugs and water are all intimately related. Each relies on the other for support and health. For example, kakahi (freshwater mussel) require native fish, particularly koaro, to complete their lifecycle. The larvae attach themselves to the inner gills of native fish before moving to soft, sandy sediments in lake and river beds. The gills of koaro are therefore a 'habitat' requirement for kakahi. Monitoring attributes as singular factors is not the approach that is taken from a Māori world-view. Observations of the environment is done by looking at attributes and also the interactions between them.

2.4 Difficulty in setting numeric outcomes

To date, there has been little development of appropriate attributes, or collection of information that will allow for the management of mahinga kai and Māori use. The expansion of current monitoring programs and data collection practices is required to monitor the appropriate attributes that provide for these values. In the absence of data around specific attributes we have included the use of narratives that demonstrate a desired environmental standard.

Nationally there are some iwi who have started to conduct and develop their own monitoring regimes within their respective regions. Many of these regimes include similar attributes, for example taonga species for consumption such as tuna, paua or pipi (see Appendix 2). Some include different attributes and some also have different values that they intend to monitor for. We suggest the outcomes in the dNRP for aquatic ecosystem health and mahinga kai and contact recreation and Māori use need to be adaptable to the work of the whaitua as they may not be appropriate at a local scale.

3. Aquatic ecosystem health and mahinga kai

In the absence of data around specific attributes, a narrative that demonstrates the desired environmental standard has been used with the intention that the whaitua will decide appropriate attributes, outcomes and limits to achieve this for their catchment.

In general, the narrative and numeric outcomes recommended for inclusion in the dNRP are intended to represent a 'good' (or healthy) state for their respective values (Greenfield et al 2013). The exceptions are for significant, regionally important, culturally significant or outstanding water-bodies where there is an expectation that these areas will be managed to a higher standard.

3.1 Outcomes that may provide for both values

As stated earlier the dNRP will manage for values that are intended to provide for two different world-views. The numeric outcomes present in the tables have all been developed through a pakeha world view, therefore they may or may not represent a 'good' (or healthy) state from the perspective of a Māori world-view. However, there may be numeric outcomes that span across both world-views. Examples are given below, categorised by waterbody.

3.1.1 Rivers

A critical scientific parameter for ecological health in rivers is the concentration of dissolved oxygen (DO) in the water. The outcome for DO in rivers and streams range from 80% to 60% saturation. At 21°C with the water at 60% saturated, the water would contain oxygen at 5.4mg/L. NIWA have found in the Te Arawa lakes that kōura could tolerate concentrations of DO as low as 1.6mg/L, although there was an appreciable decline in kōura numbers when the DO fell below 5mg/L (NIWA 2007, p21). Therefore, the proposed outcome of 5.4mg/L of DO should be adequate to sustain kōura populations.

The proposed outcomes for periphyton and macroinvertebrate community index are sufficient to sustain a 'good' ecosystem composition and should therefore be sufficient to sustain natural populations of kōura. Parkyn states that kōura eat a variety of foods and in natural populations it has been found that animal protein contributes most to growth, with aquatic snails, chironomids and mayflies being the most important invertebrate food sources (NIWA 2007, p15).

The proposed outcomes should provide for the DO and food requirements of kōura. A major variable in the natural system, which effects both the DO and invertebrate community composition is temperature. The proposed maximum temperatures range from 19°C to 23°C. There is a concern for the survival of large kōura as they may die at temperatures above 21°C (Diver 1998, p14). Jones (1981, p15-20) suggests an optimum temperature for growth as 19°C, above which the kōura become stressed. The complexity of these numerical outcomes demonstrate that while they largely provide for mahinga kai and ecosystem values concerning kōura, there is still potential for a single prolonged event that could impact on species and maybe even the ecosystem.

3.1.2 Lakes

There is a lack of information to support statements around the outcomes for lakes supporting mahinga kai practices. It is worth noting that a DO reading of 5mg/L will

support a good population of kōura, but the Trophic Level Index (TLI) used for monitoring some of the regions lakes does not include measuring DO. It is anticipated that mixing through wind action and rain will replenish the DO in the shallow coastal lakes within the region to provide for good ecological and mahinga kai values.

3.1.3 Groundwater

Mahinga kai activities do not occur within groundwater aquifers. Māori tend to interact with groundwater as it moves into the surface water environment as springs, seeps and wetlands.

3.1.4 Natural wetlands

As there are no numeric outcomes for natural wetlands we will not comment here.

3.1.5 Open coasts, harbours and estuaries

Mud content will be an important value for mahinga kai as this will determine absence/presence of some taonga species and will determine access to mahinga kai sites. Some studies on cultural attributes use qualitative scale measures to monitor mud content. For example the State of the Takiwa Cultural Health Assessment measures mud content by assessing the suitability of a site for harvesting mahinga kai, and any access issues to the site (Pauling et al. 2007). A scale rating from 1-5 is given to allow for a quantifiable value to be created. Further work will need to be conducted to determine whether the percentage of mud content listed in the dNRP will account for the values under mahinga kai or whether another form of measure should be recommended.

In contrast some iwi have chosen scientific methods to monitor waterbodies in their rohe. For example Te Uri o Hau Settlement Trust have developed an estuary monitoring toolkit with the support from NIWA that monitors percentage cover of sediment by using transects and sediment tiles (NIWA 2013). Therefore, it may be appropriate in some catchments to utilise science tools.

The Department of Conservation, the Ministry for the Environment and two east coast North Island iwi (Ngāti Kere and Ngāti Konohi) developed Māori methods and attributes for marine protection that include mātauranga (knowledge) around land-based tohu (e.g. when the kowhai are in bloom the kina are ripe) and scientific data that consisted of transects and plots and data that is available from other sources (e.g. Gisborne District Council water quality, shellfish health and beach bathing standards) (Wilson et al. 2007).

The point being that we can draw from other studies conducted and include generic outcomes however, it should be up to the whaitua to determine what attributes should be monitored in order to provide for mahinga kai outcomes on a catchment by catchment basis. Therefore it is recommended that a toolbox be created for the whaitua to choose specific attributes and monitoring methods which may consist of science methods and/or mātauranga.

3.2 Gaps analysis

Although we are confident that the numeric outcomes in the dNRP for the aquatic ecosystem health value have been through a rigourous process to determine their

accuracy, it is uncertain as to whether these same outcomes may provide for the value of mahinga kai.

There has been some work done on cultural attributes that may assist us, however most work has been conducted on areas outside the Wellington Region and include hapū and iwi that do not exercise mana whenua within the Wellington Region. A good example of this is *Using The Cultural Health Index* by Tipa and Teirney (2006). While the methodology would be helpful to apply within the region, we have no existing data to assist in the setting of attribute outcomes. We may find that there will be some discrepancies between outcomes or even the way attributes are classified for aquatic ecosystem health and mahinga kai. Some examples of these are highlighted below.

3.2.1 Rivers

Douglas (1984) introduced a classification system for waters from a Māori world-view, which classes rivers by the characteristics, its use or lack there of, and its potential to sustain life (in-stream and out) (Table 1).

Table 1: Māori water classes in relation to water use

Water Class	Ahuatanga – attributes
Waiora	The purest form of water which comes from Atua Māori (gods). Contains the source of life and wellbeing, and can be used in rituals to purify and sanctify. Waiora has the potential to give life, sustain wellbeing, and to counteract evil (heal). Water is fit for consumption.
Waimāori	Becomes waimāori when it comes into unprotected contact with humans and associated activities. It is not restricted through sacred associations. Waimaori is used to describe water that is free running or unrestrained, or water that is clear or lucid. The mauri of Waimāori can be controlled by karakia (ritual), thus making it suitable for ceremonial use.
Waikino	In the spiritual sence, waikino is water which has been polluted or debased, spoilt or corrupted. In waikino, the mauri has been altered so that the supernatural forces are non-selective and can cause harm to anyone.
Waimate	This class of water has lost its mauri and is dead. It is dangerous to humans because it can cause illness or misfortune. Geographically it refers to sluggish water, stagnant or back water.
Waitai	Waitai is water which has returned to Tangaroa, in the natural process of generation, degredation, and rejuvenation.

Given the river classing system is somewhat different for tangata whenua (when compared with those in the dNRP), it is logical to expect the outcomes to be different as well. Further work is required for tangata whenua to class their waterways, or reaches of their waterways into classes that reflect Māori values.

The use of the Macroinvertebrate Community Index (MCI) may be a measure that is too narrow to provide for mahinga kai. This is because the MCI does not monitor abundance of species, only community structure. Abundance at the lower trophic levels may have a direct affect on species that hold high mahinga kai values. For example tuna rely on a healthy macroinvertebrate community structure at all trophic levels to produce an abundance of large healthy individuals. Typically it is the apex predators that are highly valued and used as tohu (signs) to indicate the health of an area.

Another discrepancy may lie in the outcomes for periphyton biomass, as mahinga kai includes people accessing mahing kai sites. Outcomes identified in the table for periphyton biomass may be too high. Waterways often become dangerous to navigate when covered by excessive periphyton growth and the targeted species become stressed, creating an inferior experience and product. Both of these factors would diminish the mauri of the area.

Essential in providing for the value of mahinga kai is flow and the ability of the water body to support the lifecycle of taonga species. This includes contiguous connectivity between the mountains and the sea – ki uta ki tai. Physical barriers to migration for taonga species should not be created through low flow conditions or exacerbated through over allocation of the water resource. Tangata whenua recommend water bodies need to retain their ability to pulse and behave naturally. The flooding of rivers provides a pulse where natures refuse is flushed through the system and a cycle of cleansing and renewal occurs. These pulses of flood water are environmental cues for mahinga kai activities. They shape new spaces and places on our rivers and remind tangata whenua of the dynamic relationship we have with our water ways.

3.2.2 Lakes

Little is known about the safety of our taonga species collected for consumption. As water quality changes species can be exposed to algal blooms that may affect their safety for consumption. This knowledge gap is highlighted in the NIWA report (2007, p25) that acknowledges we know nothing of the impact that blue-green algae has on kōura. Freshwater crayfish are known to accumulate microcystin in their body (Liras et al. 1998). The impact of the accumulated toxins on the kōura themselves has not been investigated in New Zealand, but overseas research suggests freshwater crayfish are generally tolerant. However, the accumulated toxins may represent a risk to consumers.

3.2.3 Natural wetlands

There may also be differences in wetland classification when identified through a Māori world view. Harmsworth (2002) has identified Māori terminology for wetlands and has found that there is overlap in the classification of wetlands from a scientific perspective compared to the Māori perspective. For example a pumautanga wetland has been classified as a permanent palustrine (vegetation emergent over freshwater, not including floating plants) wetland but also a permanent lacustrine (standing open freshwater including lake, pond, pool) wetland. Within the dNRP the classification for wetlands and lakes is not the same as those explained above but comparisons between Māori definitions and those that are in the dNRP may overlap as well. For example pumautanga would be represented under the lakes table but also the wetland table.

Additionally, the definition in the dNRP for wetlands does not include estuarine waterbodies as they are classified under the coastal table. This is not an unresolvable issue but it further highlights that definitions and classifications will need to be further developed together with whānau, hapū and iwi to identify similarities and differences.

3.2.4 Groundwater

While mahinga kai activities generally do not occur within an aquifer, there are examples of the emergence of ground water as a sign of quality shellfish beds. This typically occurs around the confluence of streams and rivers with the ocean, but can also be applied to freshwater seeps observed on the foreshore at low tide. Beds of coastal shellfish tend to be present in these places where groundwater emerges within the coastal environment. The reason for the relationship between the groundwater emergence and shellfish abundance is not clearly understood. There are information gaps around the effects of subsurface water flows as a habitat requirement for various shellfish species such as tohemanga, pipi, and tipitipi.

3.2.5 Open coasts, harbours and estuaries

There are no numeric outcomes in the dNRP for taonga species or any other mahinga kai attribute and it is highly recommended that studies be conducted to fill this gap as soon as possible. Māori rely heavily on mahinga kai species in the marine environment and in some instances do not heed restrictions on mahinga kai activities in polluted areas. As this is a health issue the need for this work is essential and urgent. We can draw from previous work done in this area including Water Quality Guidelines from the MfE.

4. Contact recreation and Māori use

4.1 Outcomes that may provide for both values

As stated above Māori use encapsulates many activities that can range from walking on the beach to immersing in a river for spiritual or health reasons. As this definition is broad there may need to be further attributes to ensure the value is appropriately provided for.

4.2 Gaps analysis

4.2.1 Rivers

A silt-laden stream bed can detract tangata whenua from using the water. If the water appears dirty or fouled it is generally not desirable for Māori use. Water is often used in ceremonies for cleansing purposes. This can be both physical and spiritual cleansing, and clear flowing water free of sediment is a typical requirement.

Algal blooms and extensive weed growth also make recreational pursuits and use of the water by tangata whenua unsafe and unpleasant. A high percentage of algal cover on the stream bed can create a slipping hazard, however the actual percentage cover where those entering the water find it difficult to 'keep their feet' has not been clearly established for use as an attribute. Further work to determine acceptable algal cover for Māori use needs to be developed in response to this information gap.

4.2.2 Lakes

There is the expectation that the TLI and TLI-3 (used for ecosystem health and mahinga kai) range will support Māori use such as ceremonial use, primary contact and waka ama activities. However nuisance growth of noxious weeds such as Hornwort and *Egeria densa* may inhibit the use of waka on our lakes, or detract tangata whenua from using the area. Further investigations into weed growth and the suitability of the lake for waka ama, primary contact and ceremonial use at the proposed TLI scores need to be explored.

4.2.3 Natural wetlands

It is recommended that *E.coli* outcomes be included in the dNRP for wetlands. Wetlands are significant to Māori as many mahinga kai species, taonga species and resources are found within wetland systems (see Appendix 2 for important mahinga kai species found in wetlands). Harvesting and collecting of taonga would sometimes require the individual to wade or swim in the water. Therefore it is recommended that some health and aesthetic outcomes (such as are included in the Rivers table) should be included for wetlands.

4.2.4 Groundwater

The relationship between groundwater and the value contact recreation and Māori use is quite vague. However, there is no doubt that management of groundwater and its interaction with surface waters is a key element in providing for Māori use. A good example of tangata whenua recognising this interaction is the Waiohine groundwater zone and the Papawai Stream. The Papawai Stream is understood to be connected to the groundwater zone of the Waiohine River. The puna (fresh water springs) that feed the Papawai Stream need to flow freely, year round, with water that is suitable for the whanau at Papawai marae for cleasing purposes. Outcomes, and limits to achieve

these, for water to be suitable for cleansing need to be established by tangata whenua at the whaitua level.

4.2.5 Open coasts, harbours and estuaries

It is recommended that *E.coli* outcomes be further investigated for estuaries to provide for Māori use. Estuaries are significant to Māori as many mahinga kai species, taonga species and resources are found within estuarine systems (see Appendix 2 for important mahinga kai species found in estuaries). Harvesting and collecting of taonga would sometimes require the individual to wade or swim in the water. Therefore it is recommended that some health and aesthetic outcomes (such as are included in the Rivers table) should be included for estuaries.

The narrative outcome ”Concentrations of contaminants, including pathogens, are sufficiently low for shellfish to be safe to collect and consume where appropriate” is extremely important to Māori as many Māori historically and contemporarily use the coast and estuaries as their food basket.

4.3 Reducing the knowledge gap

As expressed above further work needs to be done to reduce the knowledge gap that will allow GWRC to develop appropriate attributes and outcomes for mahinga kai and Māori use. Due to the diversity of values that different hapū and/or iwi have with fresh and coastal water, this gap might only be plugged at a very local level.

Ongoing effort is required to engage with Māori and continue building and maintaining relationships with whānau, hapū and iwi at a local and regional level, under the principles of the Treaty of Waitangi, so that a partnership can be formed.

There are two knowledge systems that are relevant here, the Māori knowledge system Mātauranga and the science knowledge system. Both systems need to be acknowledged and accepted as being as valid as each other. Those that engage with hapū and iwi will need to respect the view of the participants and vice versa.

As explained above there has been a lot of work done outside of the Wellington Region on the development of cultural attributes that could be utilised to develop a framework to engage with whānau, hapū and iwi. Pivotal to this is providing adequate resources, both in staff hours as well as an operating budget to be able to effectively engage with the various hapū and iwi around the motu.

4.4 An example of Māori attribute monitoring

The following example is based on previous research and experience of Ngāti Raukawa interactions with Lake Waiorongomai. These experiences have helped form the proposed attributes that could be used in a monitoring program for the lake. While the described attribute measures have not been used previously in a formalised monitoring program, they have been used informally for a number of years through the practice of mahinga kai and customary use.

The mātauranga (knowledge) that iwi, hapū and whānau have always relied on, and the interaction with specific places within the environment could potentially contribute to a GWRC monitoring program for assessing the implementation of the regional plan. Within the Ōtaki area, one such place is Waiorongomai, a coastal dune

lake with a small stream that shares the same name. The lake has been identified in the dNRP as a significant site for tangata whenua in Schedule B and is included in Schedule C as Ngā Taonga nui ā Kiwa. Whilst there are numerous reasons for its significance to tangata whenua it has always been a place prized for mahinga kai with a particular emphasis on tuna (freshwater eel).

The significance of the lake and its ability to sustainably produce quality tuna was exemplified with Waiorongomai supplying thousands of tuna for the opening of both Rangiatea Church and Raukawa Marae. The ability of the lake to regularly produce quality tuna has contributed to the reverence that tangata whenua have placed upon the lake.

However, over the past 50 years, tangata whenua have witnessed the draining of surrounding wetlands, the intensification of stock numbers impacting on the lake, and the introduction of various weeds into the lake and riparian environs. These changes have had an impact on the quality and quantity of tuna now available from the lake. Specifically, the lake still holds many thousands of tuna, but they are often small and malnourished.

Previous research in the Raukawa rohe has determined that tuna 700g or over are the preferred size class for customary preperation techniques such as Raurekau and pāwhara. However, Lake Waiorongomai is known locally for producing a slightly smaller tuna and as such, a 600g tuna would be considered appropriate for this specific site[4]. Tuna between the size class of 400 and 600g are suitable for boiling (traditionally with Ti Kouka/cabbage tree shoots) or deep fried in chunks. Tuna below 400g are considered too small and have been referred to as ‘shoe strings’. Accordingly, tuna from Lake Waiorongomai can be easily classed into three categories:

1. 600g or over – Rawe/Excellent

2. 400 to 599g – Ahua pai/Fair

3. less than 400g – Huakore/unuseable or inappropriate

In addition to the size of the tuna it is also important to monitor the quality and quantity of the tuna within the lake. The quality of tuna is related to the size for customary use, but it also relates to the condition of the tuna. In areas where low dissolved oxygen conditions persist it is not uncommon for tuna to develop fungal growth on their fins, bodies and head. If fungal growth is observed on the heads of tuna it is a sign of poor water quality and renders the tuna Huakore or inappropriate for use. The occurrence of fungal disease on the heads of tuna reflects poorly on the ability of the site to provide for mahinga kai.

A simple scale for fungal monitoring for tuna would be:

1. No fungal disease observed on catch – Rawe/excellent

2. Less than 5% of catch with fungal disease on fins – Pai/Good

[4] Waiorongomai has predominantly short fin tuna and this measure is attributed to this species.

3. Between 5 and 10% of catch with fungal disease on fins – Ahua pai/Fair

4. Between 10 and 20% of catch with fungal disease on fins, or fungal disease on the body – Mamate/Poor or tressed state

5. Greater than 20% fungal disease on fins, or fungal disease on the head – Huakore/unusable or inappropriate

It has already been stated that Waiorongomai was reknowned for producing numerous quality tuna. The previous passages have briefly discussed quality of tuna but the quantity of tuna also needs to be addressed. Within Lake Waiorongomai it is not unusual to catch over 80 tuna overnight in a baited net. However, the objective for mahinga kai in Waiorongomai is to provide tuna of a size, quality, and quantity suitable for the area. With this in mind, a single baited net[5], set overnight should should provide for a 'batch' of tuna suitable for kai. A 'batch' of tuna caught in a single night could be simply categorised in a form as illustrated below.

1. In excess of twenty tuna over 600g – Rawe/Excellent

2. Between 10 and 20 tuna over 600g – Pai/Good

3. Between 6 to 10 tuna over 600g, or over 25 tuna between 400 and 600g – Ahua pai/Fair

4. Less than 6 tuna over 600g, or less than 25 tuna between 400 and 600g – Mamate/Poor or stressed state

5. No tuna over 600g, or less than 15 tuna between 400 and 600g – Huakore/Unsuitable

The current status of Waiorongomai would consistently produce tuna in the Ahua Pai and Mamate range. Recent research has produced results of 90-95% of the tuna below 400g[6]. This is principly due to a lack of food in the lake and has been attributed to lake drainage, poor riparian environment, and a compromised connection to the sea. Waiorongomai has been subject to a restoration project in 2013-2015 which will go some way to remedying these issues and should result in improved mahinga kai.

[5] The quality of the bait will affect the results. A quality bait would include a scorched lake bird or rabbit/hare, shellfish, or oily sea fish.
[6] Unpublished Iwi research and data currently subject to PhD restrictions.

5. Conclusion

The purpose of this document was to explain the approach taken and to describe how we arrived at the outcomes for mahinga kai and Māori use included in the dNRP. As highlighted earlier the outcomes for mahinga kai and Māori use are narrative in form due to gaps in information and documented knowledge. Although the authors support the numeric outcomes that sit under aquatic ecosystem health and contact recreation, the main points in the document are focussed around the gaps and further work that needs to be conducted. Specifically, so that relevant attributes and outcomes can be developed to monitor for mahinga kai and Māori use values but also to test whether numeric outcomes present in the dNRP also provide for those values.

Furthermore, this document does not provide an exhaustive list of gaps and difficulties but only a few to indicate the urgent need for further work in this area. Development of attributes, numeric outcomes and monitoring regimes can not be developed in isolation but need to be formed through engagement with whānau, hapū and iwi that have mana whenua within the Wellington Region. This approach may identify that some attributes cannot be used over the whole region and may only be relevant to a few hapū or iwi. It is therefore recommended that these variations, if any, be considered and included in the whaitua chapters of the plan.

It is recommended that a framework be used or developed to allow for GWRC staff to engage with whānau, hapū and iwi. This can be used to identify 1) their aspirations and values for each waterbody, 2) to determine what attributes would be relevant to monitor for these aspirations and values, and 3) to develop a monitoring regime. This is an urgent first step that needs to be conducted before any numeric outcomes can be developed or limits set for mahinga kai and Māori use in the final Natural Resources Plan.

This approach may take a long time to develop. Therefore it is recommended that the narrative outcomes be kept until such time as numeric outcomes and limits are developed. For management purposes this makes it difficult to determine whether sites are meeting outcomes or not. However, there are some communities and whānau that have extensive mātauranga in specific areas that could be used to provide a baseline measure of a healthy ecosystem. Using an engagement framework developed for the purposes above would allow GWRC to determine if an ecosystem is meeting the narrative outcomes not only for mahinga kai and Māori use but also aquatic ecosystem health and contact recreation.

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Appendix 1

Example objectives cascade for rivers and streams

Value	Broad narrative objectives	Tight narrative objectives	Measurable objectives or Indicators	Notes/gaps
Aquatic ecosystem health and mahinga kai	Taonga species identified by tangata whenua are present in quantities and of a quality that is appropriate for the area and safe to eat.	Taonga species are safe to eat and free of pollutants that can cause harm to the species and to people. The quality of taonga species are suitable for a range of cooking/preparation techniques and will elevate the mana of tangata whenua if served on a marae. Taonga species are available in quantities to support Māori customary harvest for hui. Taonga species and the environments in which they utilise are resilient to environmental changes caused by activities on the land and in the water. Taonga species are free of obvious signs of disease or mutation.	Flesh tests (shellfish, crustacean, fish) comply with World Health Organisation standards A variety of size classes specified by tangata whenua are available from identified sites to enable different preparation techniques of taonga species. Taonga mahinga kai species are available from sites identified by tangata whenua, and are being served at hui on the marae Catch per unit effort (CPU) of taonga species is trending upwards in sites of significance. The apex predator in streams and rivers is indigenous to the site. Seasonal availability of taonga species follow natural patterns. Populations of taonga species have wide demographic variation and unbiased size distribution. The life cycles of taonga species, including fish passage and symbiotic relationships, are not compromised by catchment-based activities. Recruitment of juvenile taonga species is stable or trending upward. Niche habitats for taonga species are maintained or actively restored.	Draft taonga species for rivers and streams could include: Tuna (longfin), Inanga, Ngaore (whitebait), Patiki (flounder), Tikihemi (Smelt), Kanae (mullet), Watercress Other species for potential inclusion but less prominent in rivers and streams, more indicator species: Kakahi (freshwater mussel), Kokopu (Banded, Giant, and Shortjaw), Koura/Kewai (freshwater cray), Piharau (Lamprey) Strong species dependence/relationship; • Tuna rely on Inanga, Bullies • Kakahi rely on Koaro HUGE gaps. Need for Maori monitoring program. National fish database could be helpful as is the predictive fish model created by Dr Mike Joy. Unsure of GWRC or Public Health flesh tests on shellfish etc Mahinga Kai log books at marae and with Iwi kaitiaki who issue customary take permits. Fisheries records could help inform some species and places.

Appendix 2

Examples of taonga species

Species	Water body	Reference
Tuna	Rivers & Streams, Lakes, Wetlands	Harmsworth, 2002
Kākahi/Kaio	Rivers & Streams, Wetlands	Harmsworth, 2002
Kōura	Rivers & Streams, Wetlands	Harmsworth, 2002
Inanga	Rivers & Streams, Wetlands	Harmsworth, 2002
Paraki	Wetlands	Harmsworth, 2002
Lamprey	Wetlands	Harmsworth, 2002
Aua/Kanae	Wetlands	Harmsworth, 2002
Kāwai	Wetlands	Harmsworth, 2002
Mohoao/Pātiki	Estuaries; Open Coasts	Harmsworth, 2002; Wilson *et al.* 2007
Pipi	Estuaries, Open Coasts	Harmsworth, 2002; Wilson *et al.* 2007
Tuangi	Estuaries, Open Coasts	Harmsworth, 2002; Wilson *et al.* 2007
Kōura (moana)	Open Coasts	Wilson *et al.* 2007
Paua	Open Coasts	Wilson *et al.* 2007
Kina	Open Coasts	Wilson *et al.* 2007
Pupu	Open Coasts	Wilson *et al.* 2007
Tuangi	Open Coasts	Wilson *et al.* 2007
Parengo	Open Coasts	Wilson *et al.* 2007
Kuku	Open Coasts	Wilson *et al.* 2007