



Stakeholder Study of Wairarapa Moana Regarding the Management of the Blundell Barrage Gates

An Interactive Qualifying Project proposal to be submitted to the faculty of
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Submitted by:

Natalie Diltz
Jena Mazzucco
Austin Scott
Jeffrey Sirocki

Submitted to:

Prof. Bethel Eddy
Prof. Robert Kinicki
Prof. Stephen McCauley

Project Liaison:

Ian Gunn, Greater Wellington Regional Council

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Chapter 1: Introduction

Resource management conflicts revolve around multiple groups desiring to control a valuable asset. Often times, these resources are necessary for life and a culture's sustainability. For instance, water is essential for life, and many cultures base their entire livelihoods on the location of water (Klare, n.d.). The Olympic Peninsula in Washington houses a forest of old growth trees that is the subject of a resource management conflict. Lumbering in the region reduced most of the trees outside the protected park into tree plantations. The underlying problem revolves around the differences in the way people value resources. One party values the presence of ancient trees, whereas the other values the commodity of cutting and selling the trees. There is a disparity in how groups value the forest. Some view it as an ecological treasure, and others view it as an economic opportunity (Lambert, n.d.).

In the Wairarapa region, located on the northern island of New Zealand, the Greater Wellington Regional Council is currently dealing with a resource management conflict on a political, economic, ecological and cultural scale. The main problem revolves around the management of Lake Wairarapa, and the competing interests of those who live around the lake. Flood control is a major part of the controversy, polarizing different stakeholders in the community.

This started in the 1840s when Europeans initiated settlement around Lake Wairarapa. The British Crown breached an agreement with the Maori (indigenous people) by unlawfully buying and selling Maori land. This stemmed from a conflict of livelihoods between the *Pakeha* (Europeans) and the Maori over the lake resource. The argument was essentially a choice between "fish vs. sheep" where the Maori required high water levels for fishing and farmers required low water levels for sheep grazing. The government ultimately worked in the best interest of the farmers and developed a flood prevention scheme to keep the lake water levels low, much to the detriment of the Maori fishermen (Grant, 2012).

The resource consent that details the management plan for the lake is up for renewal in 2019. This resource consent permits the operation of the barrage gates that control the lake levels in the flood protection scheme. The Greater Wellington Regional Council, the governing body in charge of the flood prevention, is responsible for renewing the resource consent. This requires the approval of a council, who bases their decision on the consensus of the affected stakeholders.

It is important to take into consideration the points of view of each stakeholder, so that the GWRC can develop an effective compromise.

The essential goal of this project is to assist the Greater Wellington Regional Council in gathering the information they need to build a consensus regarding the management of the lake. We will accomplish this by interviewing a set of four stakeholders including the Rangitane (a Maori tribe), the Department of Conservation, farmers located at the southern end of the lake, and the South Wairarapa District Council. Through interviews, this project will foster an understanding of stakeholder opinions regarding the flood management of Wairarapa Moana. The Greater Wellington Regional Council will use this information to develop an application for the resource consent that best addresses the needs of the individual stakeholders in the region.

Chapter 2: Background

Lake Wairarapa is a shallow lake in New Zealand situated on the southern end of the northern island. The Wairarapa Moana Region, shown in Figure 1, regularly flooded until the Wairarapa Catchment Board, consisting of local residents, developed a flood prevention scheme called the Lower Wairarapa Valley Development Scheme (LWVDS) in 1960. This enabled farmers to harvest more land, however, the flood prevention measures caused Lake Wairarapa to become one of the ten most polluted lakes in New Zealand.



*Figure 1: The Wairarapa Moana region includes Lake Wairarapa and Lake Onoke.
(Wairarapa Combined District Map Viewer, 2015)*

The Lower Wairarapa Development Scheme established a set of barrage gates that control water levels in Lake Wairarapa. A resource consent gives the Greater Wellington Regional Council permission to manage the barrage gates. This resource consent is up for renewal in 2019. The goal of the Greater Wellington Regional Council is to assess the conflicting

expectations and needs of each stakeholder in the region concerning the lake's current management. This study concerns the following stakeholders:

- The Greater Wellington Regional Council, our sponsor, manages the water level of the lake via six barrage gates.
- The Rangitane are one of the two local iwi that live in the area surrounding Lake Wairarapa.
- The Department of Conservation is responsible for conserving New Zealand's natural and historic heritage.
- The farmers around the Ruamahanga cutoff significantly contribute to the economy of the region.
- The South Wairarapa District Council aims to serve and welcome residents and visitors alike in the district and manages parks and reserves.

2.1 Land Conflicts in Wairarapa Moana

2.1.1 History of the Treaty of Waitangi

The British Crown and over five hundred Maori chiefs signed the Treaty of Waitangi in 1840 to establish the Crown's sovereign rule over New Zealand. The Maori people supported the treaty because of the promised regulations on settlement and land sales. They were in favor of the potential economic benefits and the reduction in inter-tribal warfare. Maori also assumed that the Crown and the Maori chiefs would share authority (Orange, 2012). However, there were many complications associated with its signing, enforcement, and maintenance that are still without resolution today. Discrepancies between the English and Maori versions of the treaty prevented a mutual understanding between both parties. This led the chiefs to believe that they were maintaining more of their power than in actuality. The Crown felt that the Maori leadership threatened Crown authority. Just four years after the signing of the Treaty of Waitangi, Crown officials began limiting the rights of the chiefs, which breached the signed agreement (Orange, 2012).

The ambiguity surrounding the treaty resulted in warfare between the government and the Maori tribes. The Crown's sovereign rule forced all chiefs to comply with the rules of the treaty,

including many chiefs who did not agree to sign. Initially, a stronger Maori authority lingered because the Crown did not enforce sovereign rule in many remote areas of New Zealand. Overtime, the Crown gained influence and excluded Maori from national government decisions. Tension between the Maori and Crown inevitably led to the British invading Waikato in the 1860s. There is argument over whether this war functioned as a means to suppress the Maori rebellion or for the Crown to assert supremacy. Regardless, the Maori felt the Crown did not respect their rights and freedoms under the Treaty of Waitangi. (Orange, 2012).

Acknowledgement of Waitangi Day instilled a greater understanding between the Maori and the Crown by increasing treaty awareness among the public. The Crown began reconciliation with the creation of the Treaty of Waitangi Act 1975. This established the Waitangi Tribunal, a commission that evaluates Maori claims about breaches in the treaty (Orange, 2012). To this day, the Waitangi Tribunal works diligently to correct many land disputes between the Crown and the Maori tribes by assessing settlement claims among many tribes. The treaty failed to protect the Maori people from falling victim to unruly land sales, which the Crown often encouraged. Native tribes all across New Zealand felt the grievances experienced by the Maori tribes in the Wairarapa region (Orange, 2012).

2.1.2 Breaches in the Treaty

The economic interests of the Crown brought the settlers to the Wairarapa Moana region, which led to breaches in the Treaty of Waitangi. The British desired to recreate a settlement similar to their homeland. The Maori wanted the treaty to prevent the settlers from overwhelming their land, however British settlers began farming only four years after the signing of the Treaty of Waitangi. The Crown wanted to purchase Wairarapa Moana land from the Maori tribes when the settlers pressured for the installation of a ferry service. The Crown promised benefits to get the Maori to sell the land at a cheap price. These included using the Crown's influence to create land reserves and reap the benefits of the local settlers by participating in the market economy. The Maori sold millions of acres to the government with the expectation that the settlers would not develop land below the *tehakupu* (high water mark) (Grant, 2012). Ultimately, the settlers acquired more land from the Maori than they were willing to sell.

The Crown never properly surveyed and documented the land, which led to issues determining how large the lake was and how much land the settlers could claim (Grant, 2012). In

1855, an earthquake dramatically altered the landscape, which allowed British settlers to acquire more land without further sale. “The earthquake lifted parts of the shallow lake out of the water, enabling settlers to graze more pasture, and allowing the government to sell land it had not purchased, much to the chagrin of local Iwi” (Grant, 2012: Pg 71). The dotted line in Figure 2 shows the land that the 1855 earthquake uplifted, and Figure 3 shows how the sand bar lengthened and closed the spit at Lake Onoke due to the earthquake of 1855 (Grapes, R., & Downes, G., 1997; p.g.s 56-57).

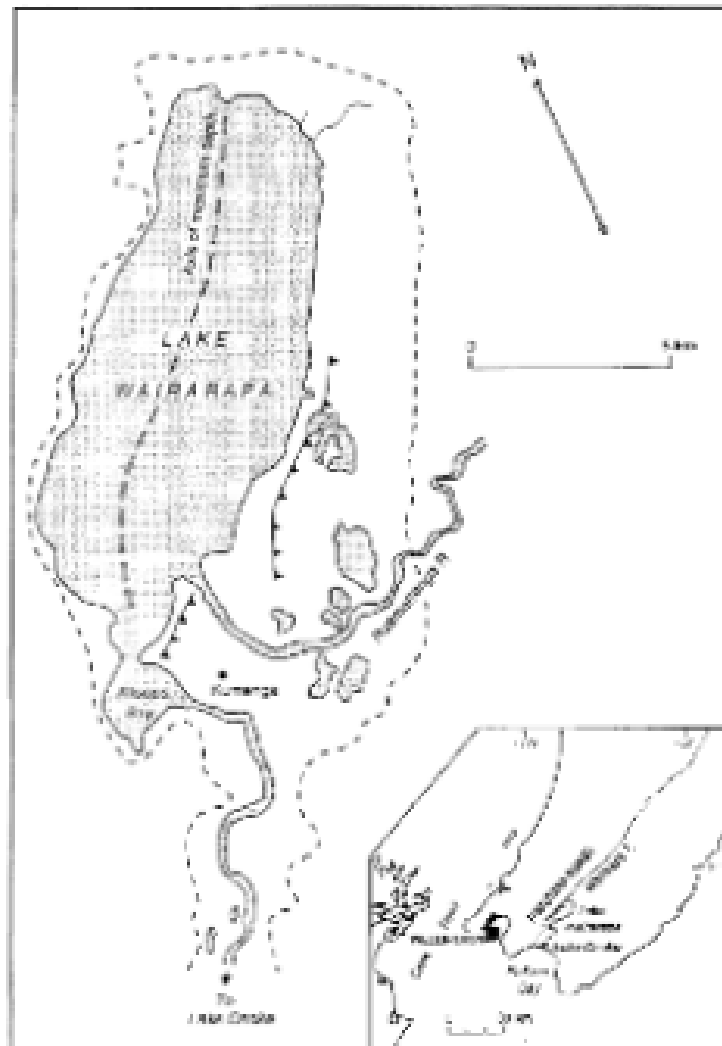


Figure 2: shows a dotted line that represents the area uplifted by the 1855 earthquake. The uplifted land fell to Crown ownership, as they failed to properly survey the land before the earthquake occurred (Grapes, R., & Downes, G., 1997; pg 56-57).

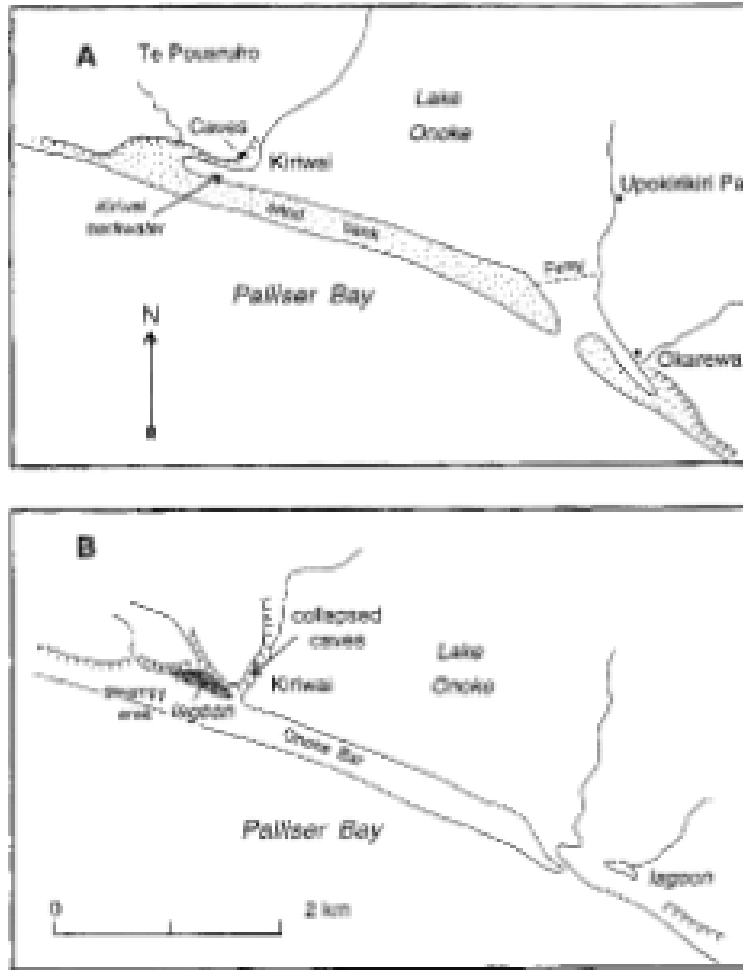


Figure 3: shows how the earthquake of 1855 altered the split opening by lengthening the sandbar (Grapes, R., & Downes, G., 1997; p.g.s 56-57).

To this day, the outlet at Lake Onoke is a point of tension between both parties. The settlers preferred to keep the lake channel open to reduce flooding and drain the lake, providing more land for grazing. However, this competed with the interest of the Maori, who needed the high water levels achieved by a closed lake outlet to maintain their tuna and eel fisheries. The Maori were willing to negotiate the allowable times for opening the outlet and to enforce a compromise as long as the wishes of the community did not conflict with the times of eel and fish harvesting. The Wairarapa Moana Maori Committee, a group that represented Maori land interest in discussions, agreed to limit the yearly harvesting yield and open the outlet ten months out of the year. The Crown rejected this compromise because they wanted to fully purchase the land (Grant, 2012).

The Crown and the settlers maintained constant pressure in their efforts to seize control of the lakes despite the Maori's legal control of the lakes, the margins, and the land surrounding the Lake Onoke outlet. The government tried unsuccessfully to gain control of Maori property by falsely declaring that the Maori did not have the legal rights to the land. The government also tried to claim public ownership using the Public Works Act to take control of the outlet. While none of these individual attempts were successful at procuring the land from the Maori, the settlers did not relent. The Ruamahanga River Board, comprised mainly of settlers, wanted the government to declare this land a public drain. The settlers threatened the Maori with fines and arrest when they peacefully protested the settlers' attempt to open the lake outlet without permission (Grant, 2012). The crown pressured generations of Maori to give up their land through breaches in the treaty and unjust actions until the Maori had no other choice but to gift the land (Grant, 2012).

2.1.3 Gifting the Land

The Maori value land as a treasure or *toanga*, which ancestors traditionally pass down from generation to generation. When the Crown left the Maori with no other option than to sell, the Maori gifted their land. The Maori believe that the land is so important that they could not possibly sell it. Instead, they transferred the land as a "chiefly gift" or *tuku rangatire* (Grant, 2012). The Wairarapa Moana Maori Committee signed the deed to turn over the land, and gifted the land as a gesture of peace and goodwill (Grant, 2012). The Maori thought that they only gave up the legal title of their lands and that they still laid claim to the waters and fisheries within the lake.

Through the chiefly gift, the Maori expected the Crown to create reserves out of the land surrounding Lake Wairarapa. Instead, the Crown made this land accessible through the Public Bodies Empowering Act of 1907, which allowed adjacent landowners to purchase the land and further encroach on the boundaries of the lake (Grant, 2012). In its place the Crown allocated a reserve to the north in Pouakani, which was a much larger area of land totaling 30,486 acres. Figure 4 represents the almost 500 km journey the Maori would have to take to reach the reserve land the Crown promised them (Wairarapa Moana Inc., n.d.). This upset the Maori since the land was not only distant from their current location, but was only given as a reserve because it was unusable by the Crown and lacked any accessibility (Grant, 2012). The Crown's lack of

consideration inevitably left the Maori legally landless, without a national identity and struggling to preserve their way of life.

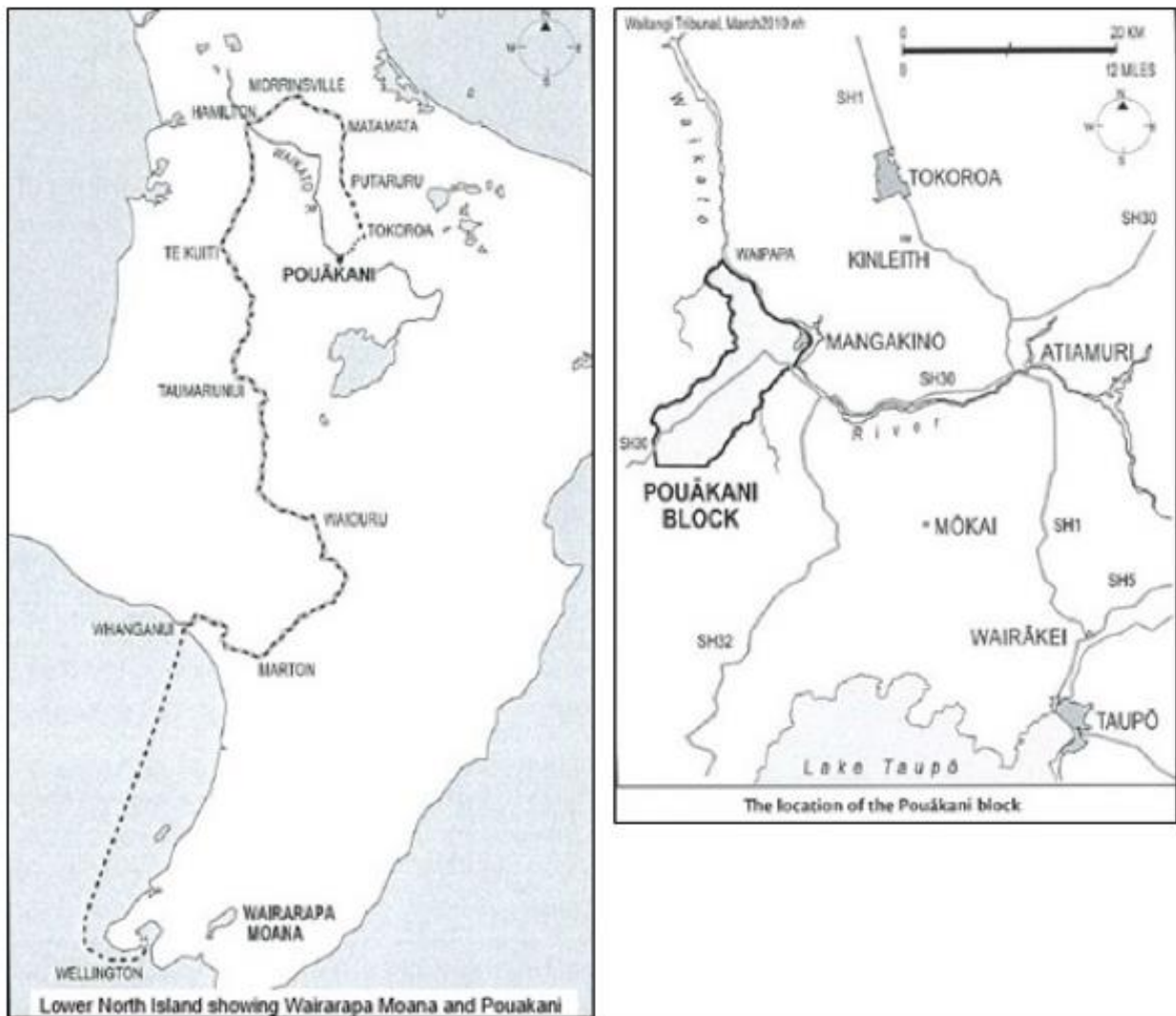


Figure 4: This picture shows the route the Maori would have had to travel to reach the reserve lands. The Maori had to travel by ferry, rail, road, and overground to reach the reserve, and the government did not build the first road until 1945. The right side of the figure shows the area of land dedicated for the reserve (Wairarapa Moana Inc. n.d.).

2.1.4 Maori Significance of Water

Most cultures depend upon water for their livelihood and form settlements based on the location of water. Having access to clean water is important to the Maori tribes so that they can perform the cultural rituals, such as *Wairua* (spiritual), *Tinana* (physical body), *Hinengaro* (mental wellbeing), and *Whanau* (transportation and recreation), all of which require the use of clean accessible water (Royal, 2011). The Wairarapa Moana region currently has a great quantity

of water, but poor water quality due to contaminants (Royal, 2011: pg 99). In certain areas there are signs that now warn against the usage of the water for food and recreational purposes due to leaking sewage from the surrounding region (Royal, 2011: pg 20). The Crown's management of many of the natural bodies results in unnatural water flow. This continues to be a controversial issue among the people of Wairarapa Moana.

2.2 Wairarapa Moana

Wairarapa Moana consists of three main bodies of water; the Ruamahanga River, Lake Onoke and Lake Wairarapa. Lake Wairarapa covers seventy-eight square kilometers making it the third largest lake in New Zealand, according to the Wairarapa Moana Wetlands Project website. The lake's main outflow is into the Ruamahanga River which flows into Lake Onoke. Lake Onoke is an Intermittently Closed and Open Lagoon (ICOLL) which opens into Palliser Bay. Tidal movements in the bay largely influence the water flow from Lake Wairarapa to Palliser Bay resulting in flow in either direction in the Ruamahanga River (Grant, 2012). This is a dynamic water system in which there can be a mix of saline water from the ocean and fresh water from the mountains several miles from the mouth of the system.

Multiple climatic factors contribute to interesting and sometimes unmanageable water levels in this region. The Wairarapa region has generally very warm summers and cool winters. This region experiences rainfall, shown in Figure 5, ranging from 800mm to 10,000mm per year with occasional heavy rainfall. Two dominant weather patterns from the Tasman Sea drive the heavy rain fall. First, the moist north-westerly winds flow upward and over the Taraua Ranges causing high intensity rainfall in the high elevation portions of the western region. Second, south-easterly winds induced by the depression to the north east contribute to heavy rain in the eastern hills (Grant, 2012).

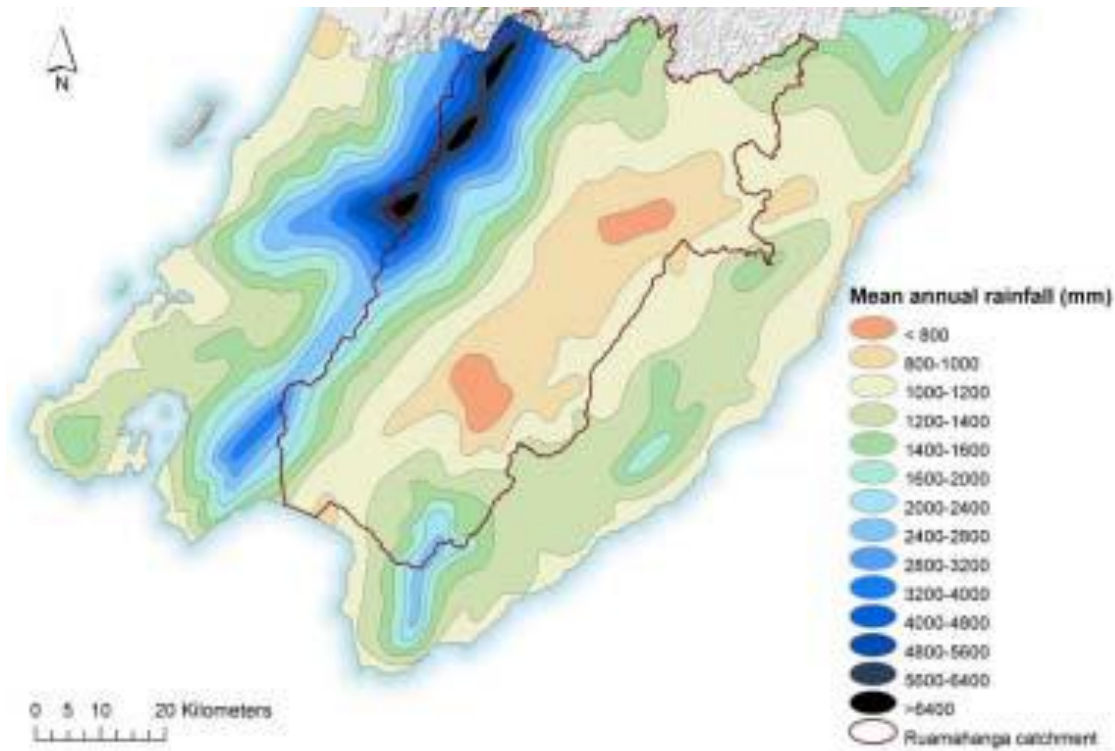


Figure 5: Mean annual rainfall in the Wellington region with Ruamahanga catchment shown based on 1950-1980 rainfall data (Watts, 2007)

Although the climatic factors impact the water levels, the lands surrounding Lake Wairarapa flood mostly due to the unique geographic features of the water system. In the past, floods would occur on a seasonal basis. This flooding turned much of the land adjacent to Lake Wairarapa into swamps which made settling and farming the land around the lake impractical. However, as European settlers developed the region, they took control of the flooding. Eventually, citizens around the lake established the Wairarapa Catchment Board, a local governing body tasked with creating a flood prevention scheme. The first flood control measure consisted of manually digging out the spit of Lake Onoke in order to let water from the system drain to the sea (Grant, 2012).

2.2.1 Lake Onoke - The Path to the Sea

Intermittently Closed and Open Lagoons (ICOLL), such as Lake Onoke, involve a bar of sediments or “spit” that separates a lake from the ocean (Haines, 2008). When the barrier spans the entire boundary between the lake and the sea, it closes or “blocks” the water system. This prevents water from moving between Lake Onoke and Palliser Bay. However, if the water levels in the lake are sufficiently high, the water can naturally overflow the barrier, break down the spit

and create an opening that will allow flow (see Figure 6). The left side of Figure 6 shows Lake Onoke with the spit opened and the right shows the blocked spit.



Figure 6: The picture on the left shows the Lake Onoke spit with a natural opening allowing water to flow. The picture on the right shows when the spit blocks. The yellow arrow indicates the Ruamahanga River. (Google, 2015)

At the southern end of Lake Onoke, tidal currents from Palliser Bay are the main source of flow and at the northern end, the Ruamahanga River is the prominent inflow. The strength of each determines the overall direction of flow. When sediment blocks the spit, the system cannot initially drain into the ocean and water levels in the Ruamahanga and Lake Onoke will rise. This is usually fine because the higher water levels in Lake Onoke will then cause the spit to naturally break down and open the outlet again. However, in conditions such as heavy rainfall, water levels can rise uncontrollably before the spit naturally breaks down. This can cause flooding around Lake Wairarapa and in the Ruamahanga River. If possible, the GWRC begins to break down the blocked spit via bulldozers. However, due to weather conditions, this is sometimes impossible and flooding dangers persist. This poses a problem for those inhabiting Wairarapa Moana (Haines, 2008).

2.2.2 Flood Prevention in the Wairarapa Region

In the 1960s the Wairarapa Catchment Board created a flood prevention scheme that protects 40,000 acres and partially protects another 13,000 acres (Grant, 2012). The board

invested 2.45 million Euros into the flood prevention scheme that took ten years to build. However, they broke even on their investment after only five years.

The flood prevention scheme, known as the Lower Wairarapa Valley Development Scheme, includes man-made stop banks, low overflow banks, the Ruamahanga cut-off, and a set of barrage gates. The stop banks are high sections of land on the either side of the water to prevent overflow. Low overflow banks allow excess water in the river to divert into the lake. The Ruamahanga cut-off is a manmade waterway which allows the river to bypass Lake Wairarapa. Preventing the Ruamahanga from flowing into the lake makes the land surrounding Lake Wairarapa less susceptible to flooding. The most significant part of the scheme is a set of barrage gates located at the conflux of the Lake Wairarapa outflow and the Ruamahanga River. The barrage gates regulate the only stream that connects the Ruamahanga River and Lake Wairarapa as shown by the green circle in Figure 7.



Figure 7: Yellow lines show the previous, natural path of the Ruamahanga River. The red line shows the Ruamahanga Diversion and the current path of the river. The green circle show the location of the barrage gates. (Google, 2015)

The barrage gates play a crucial role in the flood prevention scheme. The GWRC office in Masterton remotely controls the system, which consists of six radial arm gates. They operate the gates in order to achieve target water levels between 9.95 and 10.15 meters in Lake

Wairarapa. (Greenberg, 2014). The GWRC uses the gates for one of three roles: to let water into Lake Wairarapa, to let water out of Lake Wairarapa or to cut Lake Wairarapa off from the Ruamahanga entirely. Different configurations of the dam are necessary for different water levels and flow conditions. The barrage gates, shown in Figure 8, are important for regulating water levels, especially during periods of heavy rainfall. The scheme can handle floods with a “one in twenty years” type severity. A one in twenty years event is the most severe flood the land would typically experience over a twenty year period. Recently, the flood prevention system exceeded expectations by withstanding a one in fifty years flood (Greater Wellington Regional Council, 2014).



Figure 8: The Blundell Barrage gates (Google, 2015)

The GWRC normally operates the gates in order to prevent flow into the lake and to achieve desired water levels. However, if Lake Onoke blocks and the water levels in the river are critically high, water releases into Lake Wairarapa. The Greater Wellington Regional Council accomplishes this by raising the gates in order to relieve flooding from the Ruamahanga until they are able to reopen the spit. After the gates remain open for a long period of time, water levels in Lake Wairarapa exceed the target levels. The GWRC must maintain the spit so that the water can flow to the sea and the operators must leave the gates open to drain water from the lake back into the river. Without the presence of any extreme flood conditions or blocking conditions in Lake Onoke, the GWRC typically keeps the gates closed.

Due to the complexity of the system, water levels are difficult to regulate without disrupting the natural state of the water. The Ruamahanga cut-off and the barrage gates cause much less water to flow through the body of Lake Wairarapa. This alters the lake and causes it to be more stagnant which results in murky waters, bad smells, and pollution. Pollution in the lake causes imbalances in the entire Wairarapa Moana ecosystem. Some stakeholders oppose the Lower Wairarapa Valley Development Scheme because of the issues created by the flood prevention measures (Greater Wellington Regional Council, 2014).

2.3 Ecological Effects of the Lower Wairarapa Valley Development Scheme

Wairarapa Moana is the largest wetland complex in the lower North Island and is home to diverse plant and animal life. Historically, the overall ecology was more diverse and abundant, however major threats led to destruction and fragmentation of the indigenous ecosystems due to land-use change and commercial land management. During European settlement, the need for timber and land resulted in settlers lighting widespread fires which destroyed much of the native forest. Additionally, the Lower Wairarapa Valley Development Scheme drastically modified Wairarapa Moana through flood control. This improved the economy and increased the amount of land suitable for agricultural use. Unfortunately, this negatively affected the ecology of the lakes and its surroundings. However, organizations such as the Greater Wellington Regional Council and the Department of Conservation focus their attention on improving the current ecological conditions of the region (Bunny, et al., 2014).

2.3.1 Soils and Vegetation of the Wairarapa Moana

Today, in Wairarapa Moana there are several different areas each with their own distinct soil type and vegetation. This includes the regions around Lake Wairarapa such as the eastern and western shores, the sedgeland and the ephemeral wetlands.

Along the eastern shores of Lake Wairarapa, winds from one direction raise water levels while winds in another direction carry sediment that traps water which forms lagoons and turf fields. This area is home to about fifty-five species. Low lake water levels seasonally expose common water milfoil and pondweed (shown in Figure 9 and 10). The species in this area

survive through alternately inundated and exposed conditions and support an ecosystem that is internationally significant particularly for wading birds.



Figure 9: Milfoil at Songo Locks (Moose Pond Association, 2008)



Figure 10: American pondweed (Agrilife Extension, n.d.)

On the western side of Lake Wairarapa, a lowland forest from the Wairarapa Lakeshore Scenic Reserve lies within close proximity to the water's edge. Despite the location, the area only floods in extreme cases. Manuka, a woody plant shown in Figure 11, inhabits the sedgeland. Sedgeland is the area in between high and low water marks covered by grass-like plants that

grow in wet grounds. Additionally, invasive willows are starting to outgrow competing rushes and sedge resulting in a decreasing cabbage tree population (Grant, 2012)



Figure 11: Manuka flowers (rgbstock, 2010)

Flaxland, cabbage trees, and shrubland dominate the sedgelands. Shrublands are areas dominated by small trees with many different smaller branches that are similar to bushes. The sedgelands experience the most decline in natural habitats due to increased stock grazing and the invasion of exotic species. Near the sedgelands are the unique ephemeral wetlands which are home to a more diverse and flourishing vegetation. When flooded, the region becomes a lagoon, but in drier times flaxes and shrubs dominate. The ever-changing water levels of this area force plant life to persist through the high water times and colonize during drier times. Overall, the majority of the vegetation flourishes in the region's challenging conditions making this particular plant life unique and rare in New Zealand and internationally (Grant, 2012).

2.3.2 Degrading Water Quality of Lake Wairarapa

Lake Wairarapa is one of the ten most polluted lakes in New Zealand due to the degrading water quality. The Greater Wellington Regional Council routinely measures and documents the lake water. These measurements show elevated levels of nutrients, algal biomass and poor water clarity which contribute to the degraded water quality. The diversion of the Ruamahanga River away from Lake Wairarapa causes buildup of sediments and nutrients on the Lake Wairarapa bed. The rapid expansion and intensification of dairy farming within Wairarapa

Moana requires increasing amounts of water for irrigation. In order to produce one gallon of milk, a farmer uses up to 900 liters of water and produces significant amounts of nutrient pollution with fertilizers and effluent runoff. This causes overgrowth of weeds and algae in the waters (Grant, 2012). High algal biomass poses health risks to lake users and wildlife. The shallow nature of the lake causes low water clarity and high phosphorus levels. At 2.5 meters at its deepest point, shallow waters and decreased wave movements inhibit sediments from settling which negatively affects water quality.

A water quality characteristic known as the Trophic Level Index (TLI) classifies Lake Wairarapa as “supertrophic” meaning there are very high levels of nutrient enrichment. Eutrophication or more precisely hypertrophication, is the ecosystem's response to the addition of artificial or natural nutrients, mainly phosphates, through detergents, fertilizers, or sewage, to an aquatic system. One example is the "bloom" or great increase of phytoplankton in a water body as a response to increased levels of nutrients. Negative environmental effects include hypoxia, the depletion of oxygen in the water, which may cause death to aquatic animals. Chlorophyll *a* levels, Secchi depth (water clarity), total phosphorus and total nitrogen determine the TLI. Table 1 below demonstrates the differences in TLI between native land and farmed land.

*Table 1: National median values for selected water quality variables categorized by dominant lake catchment land cover, taken from Verburg et al. (2010). The number of lakes in each land cover category is shown in brackets.
Note: the total number of lakes used to generate median values differs between variables.*

Variable	Dominant land cover ¹	
	Native (49)	Pasture (50)
Conductivity (µS/cm)	228	192
pH	7.5	7.7
Secchi depth (m)	6.4	2
Turbidity (NTU)	0.8	3.2
Total nitrogen (mg/L)	0.149	0.7734
Ammoniacal nitrogen (mg/L)	0.006	0.013
Total phosphorus (mg/L)	0.007	0.0368
Dissolved reactive phosphorus (mg/L)	0.002	0.0025
Chlorophyll <i>a</i> (mg/m ³)	1.6	8.8
TLI	3.0 (mesotrophic)	4.9 (eutrophic)

¹Dominant lake catchment land cover was determined by the largest percentage of land cover within a catchment (Verburg et al. 2010), although the authors note that land cover/uses that are not dominant can also have a significant impact on lakes water quality.

All of the above elements of water quality fluctuate, specifically with the seasons. Total nitrogen concentrations are highest in the winter due to wetter soils and a higher groundwater table in Wairarapa Moana. This promotes the transport of nitrogen into groundwater that eventually flows into the Lake Wairarapa. Concentrations of total phosphorus are highest in spring and early summer when farming production is at its peak. High winds in spring and early summer suspend sediment in the water. Wind increases disturbance within the lake, however the Greater Wellington Regional Council test samples under calm conditions. Therefore, the tested samples indicate better quality. Saline in the water improves water clarity and reduces levels of phosphorus and chlorophyll through a diluting effect. Saline water previously backflowed from Lake Onoke into Lake Wairarapa regularly. However, the implementation of the barrage gates dramatically reduced the amount of saline backflow (Bunny, et al, 2014).

2.3.3 Birds of Lake Wairarapa

Wairarapa Moana contains one of the most diverse populations of birds in New Zealand. Over one hundred species enjoy Lake Wairarapa's ideal conditions. The wetlands of Lake Wairarapa support over 10,000 waterfowl (Beadel, et al, 2000). Dabchick and scaup shown in Figure 12 and 13 respectively along with the shoveler, Black Swan, and Canadian geese populate the open water (DoC & GWRC, 2015).



Figure 12: Dabchick (New Zealand Birds Online, 2015)

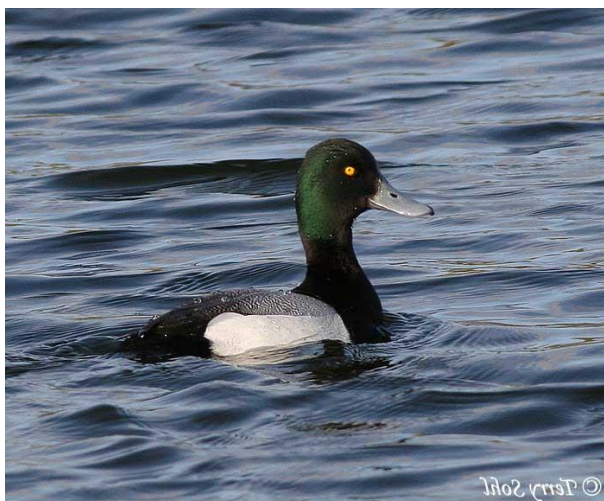


Figure 13: Scaup (South Dakota Birds, n.d.)

Waders and oystercatchers search for food along the lakeshore. The eastern side attracts migratory wading birds that come from all over for seasonal use. Scaup and dabchick find their home at the northern end of the lake while Australasian Bittern nest in the raupo plant. Records show a total of seventy-five native and twenty-six introduced bird species in the area, including nineteen nationally threatened birds and forty-six regionally threatened birds. In order to protect these species, the GWRC and the DoC, along with other organizations must address the pollution of the lake (Grant, 2012).

2.3.4 Aquatic Species of Lake Wairarapa

The dynamic water system of Wairarapa Moana contributes to a matchless population of aquatic species. Fifty percent of New Zealand's native freshwater fish inhabit the region, many of which are diadromous species. Diadromous species, such as eel, migrate between freshwater and seawater to complete their life cycle (see Figure 14). Lake Onoke blocks routinely from February to May. This season coincides with eel migration out to sea. Blocked water keeps the eels in the lake which allows local Maori fishermen to harvest them. Shortfin eel, common bully and brown mudfish are popular in the eastern wetlands, while longfin eel prefer more restricted areas such as privately owned lagoons. Other common species including grey mullet, common smelt, black flounder, torrentfish, and giant kokopu shown in Figure 15 live in Wairarapa Moana (DoC & GWRC, 2015).

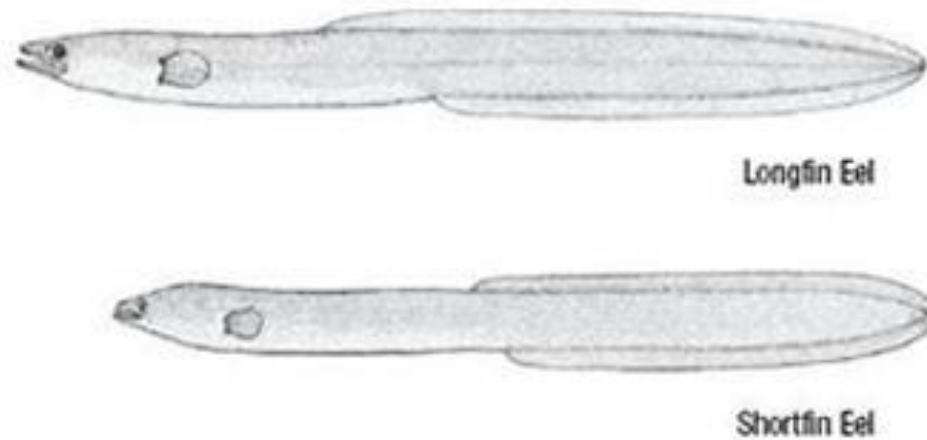


Figure 14: New Zealand Shortfin and Longfin Eel (Ministry of Primary Industries, 2012)



Figure 15: Elusive creatures of the stream (Otago Daily Times, 2013)

2.3.5 Ecological Threats

Invasive plants, pest animals, and increased land use all pose threats to the ecology of Wairarapa Moana. The loss of areas known as riparian zones in order to clear more land for farming causes catastrophic effects to the ecology of the region. Riparian zones mostly consist of trees and other green vegetation, which increase the water quality through capturing, storing, and treating the water through chemical and biological reactions. (Edwards, 2000). The destruction of these regions involved the removal of natural filters and resulted in loss of plant and animal

life. This factor along with drainage schemes destroyed ninety percent of the wetlands since 1840 and degraded water quality.

Farming in the region severely affects the vegetation. During European settlement, widespread fires destroyed much of the forests. Grass plains used for farming replaced the once wooded land. Now, cattle trample and destroy broadleaf shrubs and young trees. Additionally, sheep herding significantly impacts the vegetation through reduction of habitat and grazing.

Runoff from cattle and sheep, among other stock, pollute water and harm aquatic species. Failure of the Wildlife Act to protect against overfishing, in addition to manmade barriers, continue to degrade fish populations (Grant, 2012). There was an attempt to provide a passage for fish and other species through the barriers, however, these passages were not successful because they were too deep in the water. (DoC & GWRC, 2015).

Other threats on Wairarapa Moana include invasive species, pest animals, and vehicles such as quad bikes and 4WDs that damage native vegetation and disturb native wildlife. Several recorded nationally threatened plant species are becoming extinct in the region. Traditionally, rich waters and wealth of wildlife dominated Wairarapa Moana. However, today human activity profoundly changes the ecological landscape in the area (Beadal, et al, 2000). The GWRC and the DoC, among other organizations, recognize these threats and are working towards a feasible solution (DoC & GWRC, 2015).

2.4 Economic Outlook of Wairarapa

In November 2008, BERL Economics released the *Economic Profile and Projections for the Wairarapa Region*. The report highlighted the current outlook of the Wairarapa economy and explored two different future scenarios: a growth rate on par with the rest of New Zealand and a growth rate that is less than that of New Zealand. The key driver industries in the region are sheep and beef farming, horticulture and viticulture, dairy farming, food processing, wood processing and health and community services (Nana, 2008).

As of 2007, the largest contribution to employment in the Wairarapa region is the agriculture industry at 15.3% followed by business services at 7.3% and accommodation, cafes and restaurants at 6.4%. Agricultural jobs are the primary sector of employment in the region and also have a higher importance than agricultural jobs elsewhere in the country. Data based on the

location quotients of employment for the various sectors supports the importance of farming. Location quotients indicate the importance of regional employment. An “LQ” of one suggests employment similar to that of the entire country and higher LQ values suggest more intensive employment comparatively in that particular sector. Topping the list in the Wairarapa region are hunting and trapping at 2.704, agriculture at 2.560 and commercial fishing at 2.489. The Wairarapa region is the center of the New Zealand dairy. Four percent of the dairy industry resides on the 60,757 hectares of land dedicated to farming in Wairarapa Moana. The milk production has a \$474 million dollar (NZ) value in the regional economy (DairyNZ, 2013). The region relies heavily on primary industry, which is the direct marketing of natural resources, rather than manufacturing (Nana, 2008).

The BERL Economics report concludes with specific outlooks for the region which states that the more prosperous scenario results in a decrease in regional tourism. A possible cause of this could be that an increase in farming and manufacturing will make the area less desirable for people to visit. While not necessarily attractive, the current setup of the flood prevention gates and river cutoffs is vital to the agriculture and economic growth of the region. However, this does not consider the natural consequences of altering flow patterns of the water system. The report presented both advantages and disadvantages for both scenarios which shows that many factors play into the future economic well-being of the region (Nana, 2008).

2.5 Stakeholders in the Wairarapa Region

The past developments dating back to the Treaty of Waitangi and tensions over the current setup create the need to understand the stakeholders in the Wairarapa Moana region. The history of the region illuminates why the stakeholders disagree with each other over management of the lake. What is most beneficial for one stakeholder often negatively affects others. In the past, different levels of influence and power created an imbalance in discussions and decisions. This study will investigate how the Wairarapa Moana stakeholders, shown in Figure 16, perceive what is happening now and whether they want change. The following sections describe the background, interests, and influence of the Greater Wellington Regional Council and four of the stakeholders in this study.

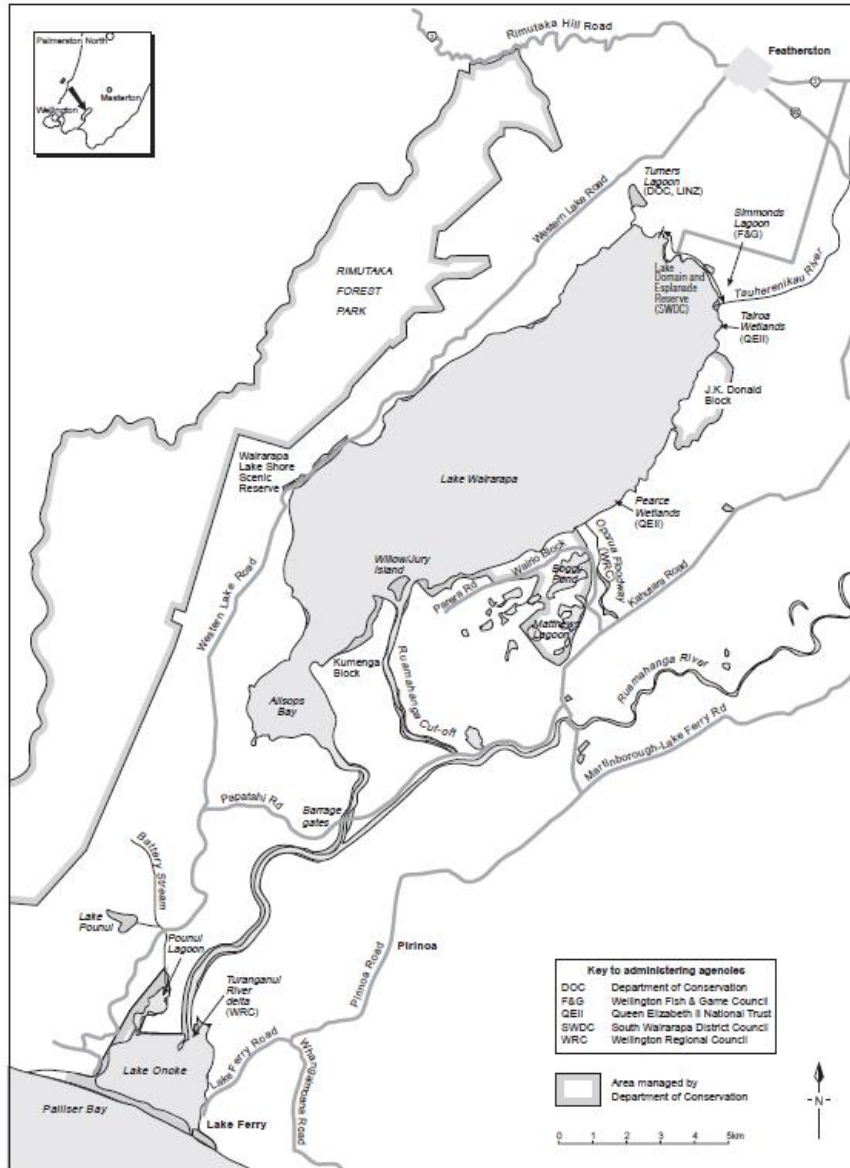


Figure 16: A map of the Lower Wairarapa region that displays the key administering agencies (Airey, 2000)

2.5.1 Greater Wellington Regional Council

The Greater Wellington Regional Council is one of New Zealand’s sixteen regional councils and is the governing body over the Wellington Region. The GWRC’s mission is to “promote quality of life by ensuring our environment is protected while meeting the economic, cultural, and social needs of the community” (GWRC, 2015). The regional council works cooperatively with the city and district councils within its boundaries, to manage natural resources, and their uses (GWRC, 2015). Overall, the GWRC’s responsibilities include:

environmental management, flood protection, land management, provision of regional parks, public transport planning and funding, and metropolitan water supply (GWRC, 2015).

The Greater Wellington Regional Council describes their objectives in a publication called the Conservation Management Strategy for Wellington 1996-2005. This document describes guidelines, shown in Appendix 1, for managing the ecological, cultural, and economic interests in the Wellington region. The guidelines emphasize the GWRC's concern about pollution, rare wildlife, and the Maori. The GWRC additionally published a document called the Memorandum of Partnership, which describes how they interact with the Maori (GWRC, 2015). They seek a mutual partnership with the *tengata whenua* or Maori and want to remedy past grievances.

The GWRC is the sponsor of this project and wants to determine the perspectives of the relevant stakeholders before the barrage gates renewal in 2019. In Wairarapa Moana, the GWRC operates the Blundell Barrage Gates under the resource consent of 1999 (Airey, 2000). To maintain order in the region, the GWRC enforces policies such as the Lower Wairarapa Development Scheme and the Resource Management Act 1991 (Airey, 2000). The aim of these policies is to control resource management and conservation.

2.5.2 Rangitane

The Rangitane iwi is one of two local Maori tribes that inhabit the land surrounding Wairarapa Moana. The iwi gets its name from an independent traveler known as Rangitane who arrived in New Zealand 700 to 800 years ago (Grant, 2012). Following Rangitane's arrival, he and twenty-eight generations of his family lived peacefully, fishing the longfin eel in the Wairarapa wetlands (Grant, 2012). After Europeans arrived, however, the Rangitane lost the majority of their land. The crown purchased the lands of Rangitane o Wairarapa throughout the 19th century and by 1900, only 5% of the land in Wairarapa remained in Maori ownership (Rangitane o Wairarapa, 2014). The breaches in the treaty and the gifting of Maori land led to the degradation of Rangitane culture and life.

Today, the Rangitane tribe is relatively small, yet, they maintain their ancestral roles so that they can preserve their traditions, culture, and land (Potangaroa, 2012). As of 2013, the Rangitane consist of nearly 4,700 people (Durie, 2014). The most recent move the Rangitane iwi made to preserve their way of life is by pursuing a settlement, WAI 175, with the Office of

Treaty Settlements. Currently, the Waitangi tribunal is discussing the WAI 175 claim which contains complexities regarding the actual size of the tribe (Rangitane o Wairarapa, 2014). Once the Crown finalizes the claim, the Rangitane will have a greater influence over the management of the lake. However, until the Crown makes a decision, the Rangitane stated they would not discuss the matter (Rangitane o Wairarapa, 2014).

2.5.3 Department of Conservation

The Department of Conservation (DoC) is the national agency responsible for protecting New Zealand's natural and historic heritage (DoC, n.d.). Early European settlement degraded much of the wildlife, ecosystems, and nature. Currently, New Zealand experiences urbanization and economic development. The DoC's mission is to allow New Zealand to develop and realize their vision of "ensuring that New Zealanders gain a wide range of benefits from healthy functioning ecosystems, recreation opportunities, and through living our history. (DoC, n.d.). The department's vision is to make New Zealand the greatest living space on Earth (DoC, n.d.).

On a large scale, the Department of Conservation maintains national parks, monitors endangered species, and offers recreational opportunities so people can experience the country's beauty. Urbanization in New Zealand creates challenges for the department, regarding the country's preservation. Contrary to popular belief, New Zealand is not unmodified or 100% pure. For example, the country converted much of its forests into farmland. Through their management, the DoC protects many of the nation's natural treasures and continues working toward the conservation of life in areas such as Wairarapa Moana.

The DoC is responsible for the majority of the Lake Wairarapa wetlands under the Conservation Act of 1987 and the Reserves Act of 1977 (Airey, 2000). In 1991, the DoC met with stakeholders to form the Lake Wairarapa Coordinating Committee (LWCC) to produce guidelines for a unified and balanced management system of the wetlands. The LWCC met twelve times and developed four goals: to protect the Maori culture, to integrate land-use, promote recreational use, and to promote public understanding and support for the protection of the Lake Wairarapa wetlands. (Robertson, 1991) The DoC 2000 - 2010 Plan of Action used these guidelines to help the region.

The Department of Conservation's past involvements display their interest in a solution that addresses the pollution in the lake and preserving Maori traditions. By determining an

effective strategy to decrease pollution, the lake's threatened wildlife can grow to restore healthy populations. If the fish populations increase, the Maori could potentially support their fishing lifestyle again. Currently, the DoC aids the GWRC in monitoring Lake Wairarapa's fish populations. The DoC plan of action from 2000-2010 made progress to restore the wetlands, however Lake Wairarapa is still one of the ten most polluted lakes in New Zealand (Airey, 2000). This study will investigate the success of the Department of Conservation and their perspective on the resource management problem.

2.5.4 Farmers around the Ruamahanga cut off and barrage gates

The first Europeans entered Wairarapa in the 1840s and considered the area ideal for pastoral farming (Schrader, 2015). By 1844, settlers drove the first flock of sheep from Wellington onto the Wairarapa plains (Schrader, 2015). Over time, the Lake Wairarapa region transformed from grasslands into farmland. Farmers colonized the land and many grew rich by selling wool from sheep and butter from cows. By the 20th century, livestock numbers grew considerably due to less flooding and new technology. Low flood levels allowed for more pastures and new technology such as aerial top dressing of phosphate and lime improved grass growth. The agricultural economy of Wairarapa started growing in the 1840s. To this day, pastoral farming remains the dominant profession in the Wairarapa workforce.

Currently, the farmers control more than 10,000 hectares of Wairarapa Moana land. The 10,000 hectares divide into 6,500 hectares of forestry block, 2,870 hectares of dairy land, and 1,325 hectares of sheep and beef pastures. Overtime the number of farms decreased, however, farms are now larger and produce more per hectare. In 1965, the average farm was 70 hectares with a herd size of 83 and milk production of 126 kilograms per day. Almost fifty years later, the average farm today is 132 hectares, has 366 cows and produces 206 kilograms of dairy per day (Schrader, 2015). Water levels impact a significant number of the farmers, who control the majority of the land adjacent to the lake. This study will identify the perspectives of specific farmers located around the Ruamahanga cut off in regards to Wairarapa Moana resource management (Schrader, 2015).

2.5.5 South Wairarapa District Council

The South Wairarapa District Council is the local governing body for three rural towns: Featherston, Greytown, and Martinborough. The council serves and welcomes residents and visitors alike in the district. The territory resides at the southern corner of the north island and is approximately 248,455 hectares (SWDC, n.d.). This local government body is responsible for road maintenance, property rates, garbage removal in addition to offering a swimming pool, library, and health services to the public (SWDC, n.d.). Furthermore, the SWDC manages urban parks and rural reserves day to day and its district contains three forest parks, beaches, vineyards, and sheep and dairy farms.

In Wairarapa Moana, the South Wairarapa District Council administers the Lake Domain Recreation Reserve at the north end of Lake Wairarapa under the Reserves Act of 1977 (Airey, 2000). The district council is responsible for controlling the harmful human effects on the wetlands. This includes hunting, boating, and driving motorized off road vehicles around the lake. The SWDC is also responsible for implementing their district plan to control the drainage of the wetlands and diversion of waterways in the wider catchment (Airey, 2000). This study will identify the local influence and interest of the SWDC to understand land management and the economic interests.

2.6 Waitangi Tribunal Settlement

The Rangitane initiated a land settlement claim with the British Crown in 2011, regarding breaches in the treaty of Waitangi. The British Crown developed a settlement agreement on March 28, 2014 for 32.5 million dollars with the Rangitane O Wairarapa and Rangitane O Tamaki Nui-A-Rua iwi (Office of Treaty Settlements, 2014). This settlement includes the return of seven Crown-owned sites to the local iwi. Although, both parties signed the deed of settlement, the Crown is still investigating competing claims and finalizing the settlement.

There are multiple claimant groups who are trying to declare ownership over the Wairarapa Moana region besides the Rangitane. The two main iwi groups in Wairarapa Moana include the Kahungunu ki Wairarapa and the Rangitane O Wairarapa, who both have conflicting claims regarding the land. The main conflict is over which hapu have lineage tracing back to which iwi. This is an issue because the origin of the hapu determines which iwi receives the land

as a result of settlement process. It also brings forth the issue of cultural identity. The hapu themselves do not know their lineage. The main lineage feud is over the Ngati Hamua, with which both iwi claim ancestry. In Maori culture, the tribe members do not own land. They lease and pass the land down through ancestral lines. Combining all of these aspects makes the land claim challenge political, cultural and legal in form (Crombie, 2015).

The Crown acknowledges their breaches in the Treaty of Waitangi and the damages that their actions inflicted upon the Rangitane. The bullets below summarize the Crowns acknowledgements:

- Falsely acquired land through expired Pakeha leases
- Failed to properly sell and pay for the land they acquired
- Failed to survey the land they acquired
- Did not provide the educational, health and economic benefits as promised
- Failed to develop accessible reserves in a timely manner
- Inflicted landlessness and severe cultural impacts on the Rangitane iwi

(Office of Treaty Settlements, 2014 pgs: 42-43).

The Crown apologizes for the techniques used to acquire the land from the Rangitane. This demonstrates the current national effort of restoring their cultural identity and reconciling for past grievances. The settlement established the Rangitane as a statutory authority over the Ruamahanga River and its tributaries, where they will work closely with the DoC with management going forward. This treaty settlement will increase the influence of the Rangitane, and will allow them to participate in decisions in regards to land management (Office of Treaty Settlements, 2014).

2.7 Future Outlook

As part of the Treaty settlement process, the Waitangi Tribunal recommends the return of all public land at Wairarapa Moana (Office of Treaty Settlements, 2014). Several different organizations currently manage the land. This division of power occurred after the Maori gifted the Wairarapa Moana region as public land to the Crown in 1896. The Department of Conservation manages the pastures, wetlands and forest in the region (Flack, n.d.). The South Wairarapa District Council is responsible for the Lake Dominion Recreation Reserve and the

Greater Wellington Regional Council regulates the floodwater reserves (Flack, n.d.). In order to plan for the future of the Wairarapa Moana region, the council members from the SWDC, GWRC and DoC “met with Kahungunu ki Wairarapa, Rangitane o Wairarapa and hapu representatives” to create the plan for the Wairarapa Moana Wetlands Park. This is an effort to reconcile past grievances and move forward with a plan that encompasses all points of view (Flack, n.d.).

The GWRC, DoC, and other organizations in the area plan to restore Wairarapa Moana to a highly valued region that inspires the future. The focus of the GWRC, DoC and other organizations in the area is to improve the current conditions so that native plants, animals, and ecosystems can thrive and the wider community can benefit from what the region has to offer (DoC & GWRC, 2015).

Researching, investigating, and planning are imperative to ensure effective ecological restoration efforts. They provide a strong foundation for decision making regarding potential management operations. Although The GWRC and DoC can acquire a multitude of information through research, investigations, and plans, it is often necessary to perform field tests to ensure that the implemented efforts are improving the conditions of the region. The Greater Wellington Regional Council studies the effect of various control regimes on native fish and monitors wading birds and waterfowl regularly. This provides the GWRC with feedback in order to evaluate their management schemes. Efforts such as these are in operation at Boggy Pond, Matthew’s Lagoon, Wairio Wetland, JK Donald, and the Blundell Barrage Gates.

There are various weed control efforts in place in order to improve current conditions for native plants. Boom spraying, ground treatment, and spot spraying from helicopters are all techniques in which the GWRC and the DoC control exotic terrestrial weeds. Controlling weeds facilitates the growth of native plant dominance by increasing size and abundance. The GWRC and DoC control aquatic exotic weeds through physical, chemical, and biological methods that will remove weeds or disturb or reduce growth. Existing biodiversities are the priority and the GWRC and DoC spends the majority of the funds on the areas that are most intact. They plan to use biocontrol agent in the future if native species populations do not increase up to standards.

The main goal of pest animal control in the Wairarapa Moana is to reduce predator populations in order for native species to breed successfully. Today, efforts by the GWRC and the DoC focus on land animals, however exotic aquatic species are also a concern. Trapping is

the main form of pest control and research on wetland birds is an ongoing effort. In 2016, the Greater Wellington Regional Council will use trail cameras to evaluate the impacts of predators in selected areas containing Caspian tern nests. Ultimately, the need to increase the native animal population drives these efforts, which will continue until these species can thrive.

Other efforts to protect the ecology of Wairarapa Moana include legal actions, surveillance, and case studies. The GWRC and the DoC will use monitoring programs and one year management agreements which will provide feedback to the GWRC and will ensure that all parties in the agreement uphold standards and regulations. The GWRC and DoC use biosecurity surveillance to confirm that new invasions do not occur. These efforts, among others enable the GWRC to see if the current operations are moving towards the overall goal of improving the conditions of Lake Wairarapa (DoC & GWRC, 2015).

2.8 Resource Consent

2.8.1 How It Works

In 1991, the New Zealand government created the Resource Management Act with the intent to ensure that local governments sustainably manage the environment. In order to accomplish this, the Resource Management Act requires approval for activities that could affect the environment granted through resource consents.

There are a number of different applications for various types of resource consents including land-use consents, water permits, discharge permits and applications for other aspects of environmental change. In order to obtain a resource consent, a person must apply via their local council. Once groups submit an application, the council examines it to determine whether or not the resource consent application complies with the Resource Management Act. If it does not, the local council works with the applicant to develop a plan that coincides with the legislation. Activities that cause significant environmental change require the consensus of all parties impacted and mandate a hearing if the stakeholders cannot reach a consensus as seen in Figure 17. Any activity that affects the environment requires a resource consent and anyone can apply.

APPLYING FOR A RESOURCE CONSENT

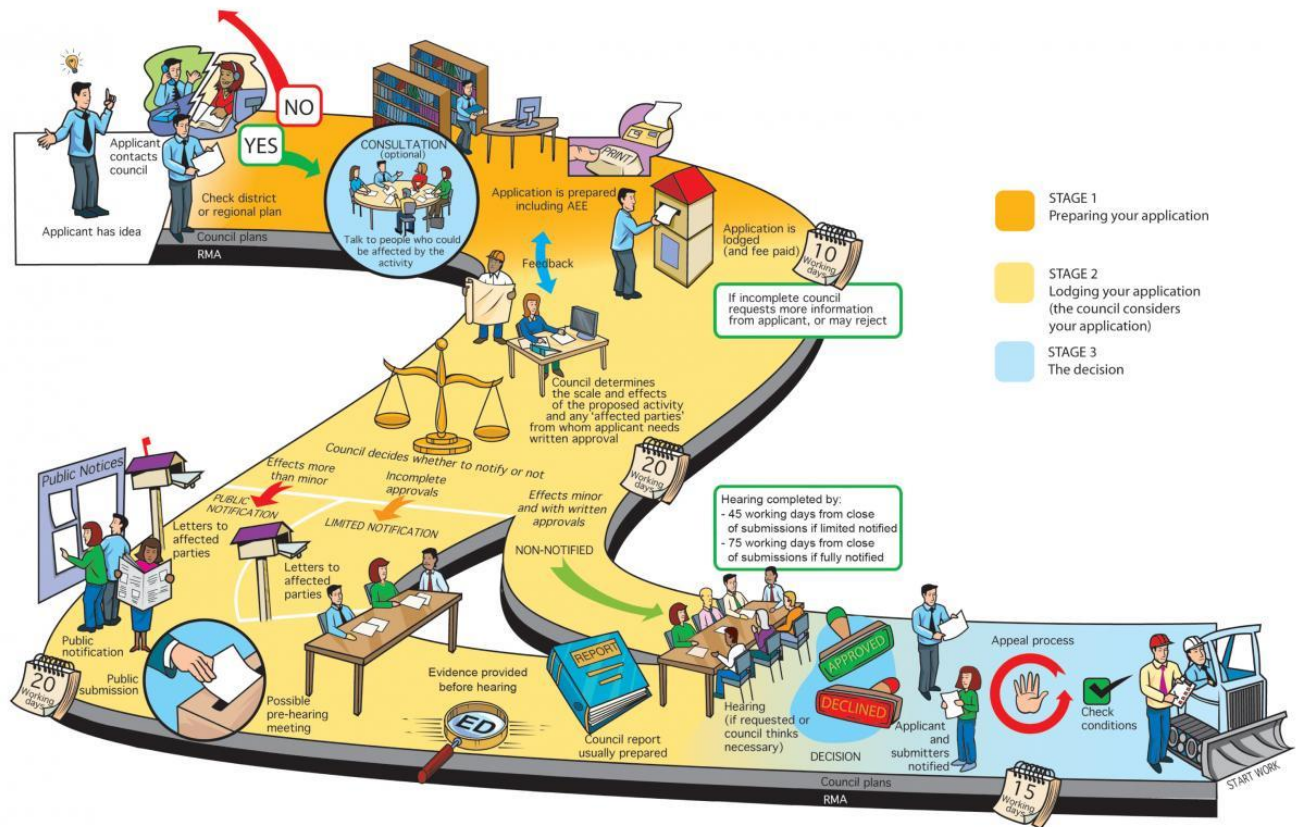


Figure 17: The process of applying for a resource consent involves many facets of the local community. It is important to consider all environmental impacts and their social implications. (Ministry for the Environment, 2015)

The Resource Management Act requires the GWRC to obtain a resource consent for the management of barrage gates because they dam and divert the water system. The Greater Wellington Regional Council's Department of Flood Protection operates the barrage gates and therefore is responsible for the resource consent application. The GWRC is also the local governing council that approves resource consent applications creating a conflict of interest. However, since the barrage gates have a significant impact on the environment, the resource consent must go through an independent commissioner panel with no GWRC affiliation. The commissioner panel consults with all stakeholders affected by the barrage gates. Any opposition to the application results in pre-hearing meetings between the GWRC and the conflicting stakeholder in attempt to reach a compromise. If there is still opposition, the commissioner panel conducts a hearing for the Flood Protection Department and the concerned parties. From the hearing, the panel decides whether or not to grant the resource consent (S. Andrewartha, personal communication, December 9, 2015).

2.8.2 Barrage Gate Resource Consent History

Prior to 1999, the Greater Wellington Regional Council operated the barrage gates based on a government order and not a resource consent. The New Zealand National Government passed the Resource Management Act in 1991, and in 1993 the GWRC began the application process for the resource consent now required for the gates. The application noted operating procedures would remain the same as before with the exception of minor seasonal variations to aid fish migration and specified maintenance procedures (Greater Wellington Regional Council, 1999).

The Rangitane, the Ngati Kahungunu and the South Wairarapa District Council's Maori Standing Committee all opposed the application submitted by the GWRC. These groups requested the monitoring of the lake, including ecological assessments, Maori participation in the management and monitoring of the lake, and a shorter term for the resource consent (Greater Wellington Regional Council, 1999).

The Department of Conservation and Wellington Fish and Game Council gave conditional support to the application, also noting the importance of a shorter term for the resource consent and requesting the monitoring of ecological effects (Greater Wellington Regional Council, 1999).

The farmers around the lake and a duck hunting advocacy organization called Ducks Unlimited supported the application in its entirety. The farmers also noted that deviation from the current scheme could have "intolerable effects" (Greater Wellington Regional Council, 1999).

The GWRC addressed these concerns by modifying their application to reflect any concerns of the stakeholders in the region. The largest areas of concern were the resource consent's term length and ecological monitoring. The GWRC determined that, although many parties in opposition expressed the need for a shorter term, the original twenty year term was acceptable. However, the council recommended a liaison meeting with the stakeholders every five years to review operation and concerns. The DoC aided in the monitoring of the lake to ensure that the barrage gates were not causing significant ecological harm (Greater Wellington Regional Council, 1999).

In a report regarding the resource consent, the Greater Wellington Regional Council noted that they would assess the actual and potential effects on the environment. This included

the effects of current lake target levels and the effects of barrage gates on flooding, recreation, and wildlife. The report outlined the appropriate management scheme pertaining to each aspect. Today, this information is useful regarding the current application process (Greater Wellington Regional Council, 1999).

As the council begins to prepare a resource consent application for the barrage gates in 2019, it is important to also consider effects brought to their attention by current stakeholders. It is the aim of this project to evaluate the needs of residents in the Lower Wairarapa Region so that the Greater Wellington Regional Council can construct a resource consent application that meets minimal public opposition.

Chapter 3: Methodology

This project's focus is to detail the points of view of each stakeholder group and improve communication within the Wairarapa Moana community regarding the management of Lake Wairarapa. To address the resource management conflict in Wairarapa Moana, we developed the following objectives:

- To observe and gain understanding of the current political, ecological, economic, and cultural situation in Wairarapa Moana
- To identify the perspectives and needs of each stakeholder group regarding the management of Lake Wairarapa
- To evaluate potential consequences of different lake management solutions

3.1 Methods

We will use interviews and focus groups to identify the attitudes of each of stakeholder in this study. We will gather accurate data with wide representation through different sampling methods that match the dynamic of each stakeholder. Ian Gunn, our sponsor liaison, will set up the initial contact with the key stakeholders.

3.1.1 Sampling Methods

Non-probability sampling methods are non-random techniques of gathering subjects for a study. These sampling methods are the most appropriate for our project because it is necessary to interview specific people. Our sponsor liaison, Ian Gunn, is going to provide us with a list of interviewees. Types of non-probability sampling we will use include availability, expert, snowball and purposive sampling.

Availability sampling is when the researcher interviews any available subject from a target group. This is acceptable when the demographic diversity is not important or when interviews are for informative purposes (Trochim, 2006).

Expert sampling is creating an interview pool of highly skilled and knowledgeable people from an applicable field. This allows the interviewer to target specific individuals that can often present exclusive information that can be difficult to obtain (Trochim, 2006).

Snowball sampling is an interviewing technique where an existing subject is used to recruit future subjects. It is the interviewer's responsibility to inquire about who to contact next. Snowball sampling is useful if the researcher targets specific information but does not know who to contact next. Often times, experts in a certain field know who the other experts are and they can recommend new contacts to the researcher (Trochim, 2006).

Purposive sampling is the use of subjects based on what the researcher deems appropriate for the study. This is the predominant method that our study will utilize. Considering that Ian Gunn will select most of our interviewees, it is important to note that our sampling method is not random. As this investigation strives to determine the general opinions from each stakeholder, it is not necessary to randomly select subjects. Instead, interviewing the leaders of each respective stakeholder group should yield the general attitude of the group as a whole (Trochim, 2006).

3.1.2 Interview Methods

When determining which type of interviews to use for each stakeholder, we considered the size and structure of each group. For interviews with experts or leaders from the DoC, SWDC and Rangitane we will use open ended interview questions which allow the interviewee to elaborate and discuss their response freely and in depth. *Open ended interviews* have a very loose structure and resemble a guided conversation in order to obtain information.

We will use structured interview questions with stakeholders groups who do not have a governing organization as a mechanism to easily compare responses. Researchers use *structured interviews* to prompt very specific responses and to prevent deviating from the carefully deliberated questions. We decided that structured interviews are important to use with any stakeholder group that is not an organization.

Semi-structured interviews allow free discussion but also have a structured plan for conducting the interview. These interviews contain a set list of questions, but offer flexibility to ask supplemental questions. Since semi-structured interviews are moderately conversational, the interviewer always asks all of the predetermined question set.

3.1.3 Interview Protocol

Interviews throughout the project require similar protocol. For stakeholder interviews, the team will typically send two members to conduct the interview. This is important so that the

interviewers do not overwhelm the interviewee. One person will take notes and the other will ask the questions. For informative interviews with the GWRC or Office of Treaty Settlements it is likely that the entire team will attend so that we can all learn the information.

We will record stakeholder interviews via a video camera or voice recorder whenever the interviewee gives us permission to do so. However, it is possible that some interviewees will not allow us to record. For such an interview, it is important that we take notes on their responses by hand citing direct quotes as necessary. We plan on reviewing all interviews and transferring the recorded audio scripts into text to ease the coding process. The interview protocol sheets for each stakeholder group in this study are attached in Appendixes B to Appendix H.

3.1.4 Focus Groups

Researchers use focus groups as a qualitative research method to gather information regarding opinions and beliefs pertaining to a certain concept. They usually consist of six to twelve people with a moderator that directs the conversation and a note taker. This research method provides a more natural environment than face-to-face interviews. Researchers use focus groups to observe the interactions between group members (Marshall & Rossman, 1999). Listening to others stimulates memories, ideas, and experiences that branch to new topics that relate to the main idea. Focus groups provide the opportunity to evaluate the strength of opinions based on the follow up comments from other members in the group (Harding, n.d.). Participants can learn from one another by exchanging and building on each other's views. This combats the extractive nature of research and provides an enriching experience for both parties (Romm, n.d.).

We plan to use focus groups to interact with the Rangitane to explore how these participants feel collectively. Focus groups are a useful tool, but unfortunately do not seem to be feasible for other stakeholder groups that have different organizational structures, like the farmers. We will determine who will participate in the Rangitane focus groups after conducting interviews with iwi leaders. When directing focus groups, it is important that we have little input in the discussion and only guide the conversation when it is getting off topic. The idea is to give everyone an opportunity to voice their opinion and for the group to collectively develop ideas about the barrage gates.

We developed specific questions for the Rangitane focus groups which we outline in Appendix G. We plan to record the data through a video or voice recording device after

receiving explicit permission to do so. Similar to the interviews, we will take notes quoting as many individuals as possible and observe body language and other visual cues. During the focus group, it is important to let the conversation develop and try to address all questions. Focus group discussions are not as linear as interviews and the interviewer must pay attention to avoid redundancy.

3.1.5 Participant Observation

Participant observation is a qualitative form of research that involves identifying multiple perspectives among a target group through interaction during everyday activities. This allows the researcher to be an “insider” while remaining an “outsider” to gain information through observation without necessarily having an impact on the given situation (Family Health International, 2009). Participant observation is useful when the researcher expects a variety of information and when their involvement will not alter the results of the data collected.

We intend to use participation observation as a tool to develop an on the ground understanding for the resource management conflict. We expect the Greater Wellington Regional Council to introduce us to the area and give us a tour of Lake Wairarapa. This will allow us to explore, photograph, and document our experience of the region as a supplement to our current research.

3.1.6 Question Types

To best determine the stakeholder’s points of view, we will develop respectful, unbiased, carefully deliberated, and relationship oriented interviews and focus groups. To plan our interviews, we will choose the appropriate questions for each stakeholder listed in Appendix C through Appendix F. These questions are broken down into three sections: knowledge, perception, and demographic.

Our interviews will ask open-ended, factual-based questions to evaluate public knowledge of Lake Wairarapa’s resource management. The purpose of these questions is to gauge what the stakeholders know about the water quality, flood levels, and resource consent. Responses from these questions will help determine interest levels for the stakeholder analysis and give accreditation to each of the stakeholder’s responses. Interviewees that are knowledgeable about the subject have valuable opinions.

The perception questions ask the stakeholders of their opinions regarding the current and future flood management. To fully understand each of the stakeholder perspectives, we ask what, how, and why. We ask *what* their thoughts are in order to identify their interests. We ask *how* they value the region in order to determine how the stakeholders prioritize their interests. Lastly, we ask *why* they desire certain outcomes in order to understand the motivations behind their interests. It is important to remain unbiased when asking these questions as to not influence the responses of each stakeholder.

The demographic questions are personal and straightforward. They ask the stakeholders about their personal background and involvement within the Wairarapa Moana. We will cross-correlate the answers to the demographic questions with both the knowledge and perception questions to help us better understand the responses. Evaluating similarities within and between stakeholder groups will provide us with the information to develop our analysis.

3.1.7 Analysis Methods

In order to conduct an analysis of the interviews, we will use key methods such as stakeholder analysis, cause and effect analysis, and coding. *Stakeholder analysis* involves determining the amount interest and influence of given stakeholder group on a controversial topic. Determining the party with the highest interest level and the greatest influence regarding a problem allows researchers to prioritize the needs of various stakeholder groups. Researchers should focus more on stakeholders with the greatest influence and interest rather than stakeholders with little interest and influence. However, researchers should consider all stakeholders even those not of high priority (Schmeer, n.d.).

Cause and effect analysis is a method in which the researcher attempts to identify all of the possible causes and their effects for a specific scenario. The analysis should include the connections between the causes and effects. It is also important to evaluate the effects of alternative scenarios. This method will be important when relating stakeholder perspectives to potential flood prevention regimes.

In order to quantitatively categorize data, we plan to code the results of our interviews. *Coding* is a method of sorting qualitative data gathered from interviews into more concrete quantitative data using a number of defined coding categories. Using coding allows the researcher to classify interviews based on key phrases that are generally used in order to

highlight the main idea of each response (Gordon, 1992). We will work as a group to determine these key phrases based on the responses from all of the interviews. At least two members of our group will independently code the scripts from the interviews and compare results. We can use Microsoft Office to organize the quantitative data collected from coding. It is then easier to see trends among stakeholder groups. We plan to code all of the interviews.

3.2 To observe and gain understanding of the current political, ecological, economic, and cultural situation in Wairarapa Moana

In the first two weeks in Wellington, we must dedicate our time to observing the current situation in order to broaden our initial background research. The team will address any potential problems with work space, transportation, and meeting times with the sponsor. Performing a participant observation through visits to Lake Wairarapa will help us better understand the region. Figure 18, demonstrates how we will further investigate unresolved questions regarding the political, ecological, economic, and cultural situation.

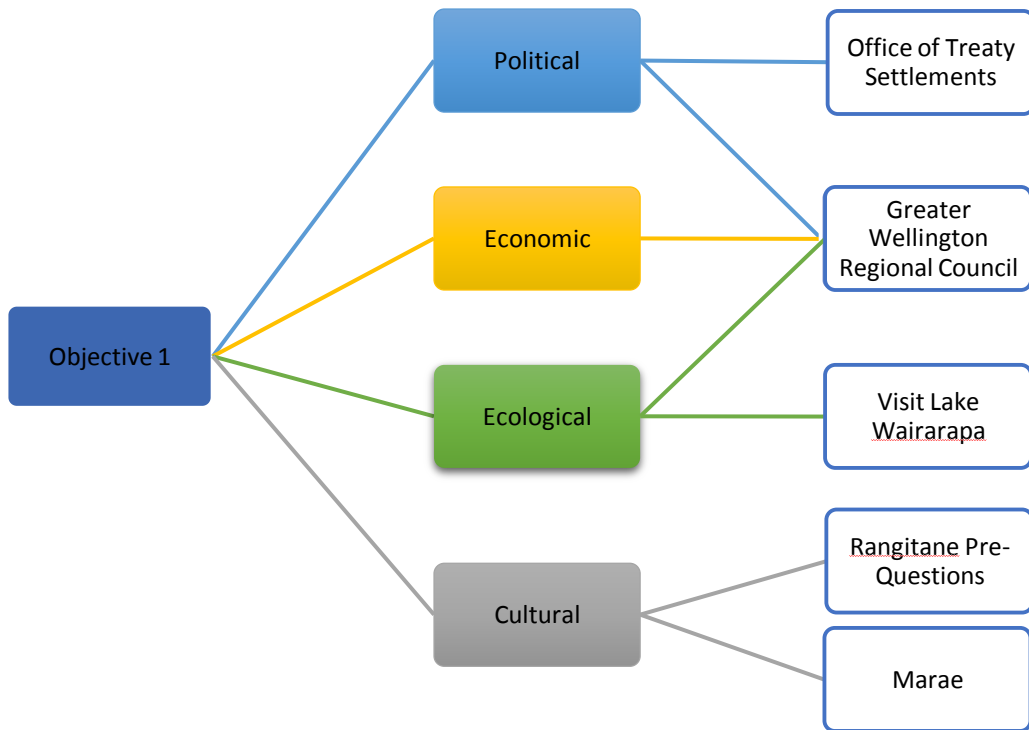


Figure 18 : Objective 1 flow chart

We will acquire information pertaining to politics by conducting unstructured interviews with the Office of Treaty Settlements following the methods described in Appendix B. These questions target information on the settlement process and when they will finalize the overlapping claims process. These interviews are important because of the lack of information available online concerning the current status of the treaty settlement. Availability sampling will be useful to speak with whoever is accessible at the Office of Treaty Settlements. Ideally this will be someone who is knowledgeable about the specifics of the settlement process, in particular the settlement process for the Rangitane. If they are unaware about the specifics of the Rangitane settlement process, we will redirect our questions to apply to a more general process. If this interview does not yield satisfactory results, the next step will be to contact someone who does know the information through email. This team will conduct this interview in the first two weeks of the project, because we need this information before proceeding with our other interviews.

To gather further information about the ecology and economy of the region, we will speak with the Greater Wellington Regional Council using protocol attached in Appendix C. We plan to interview parties suggested to us by Ian Gunn, and then grow our sample size through recommendations utilizing snowball sampling. Using these methods, this study will collect the information needed to refine our stakeholder interview questions in order to accurately capture the wants and desires of each stakeholder.

Speaking with the Greater Wellington Regional Council and sending initial questions to the Rangitane will accomplish an understanding of the current cultural situation. This correspondence will contain knowledge about the specific cultural needs and expectations of this iwi. The Rangitane will deliberate over preliminary discussion topics sent to our sponsor in order to help them prepare for the interviews. The feedback received from the Greater Wellington Regional Council, and potentially the Rangitane, will help formulate our questions for the interviews with the Rangitane. Overall, this objective will develop a strong foundation of the current political, ecological, economic, and cultural information for the completion of this projects objectives over the seven week schedule shown in Figure 19.

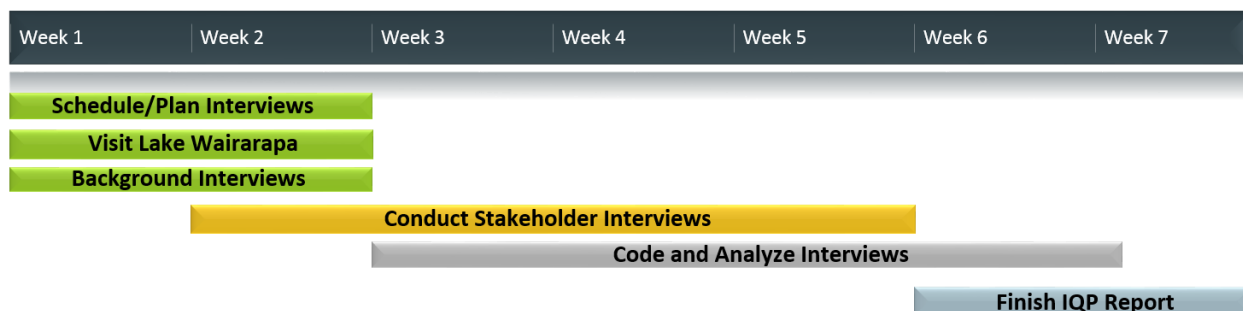


Figure 19: Gantt chart

3.3 To identify the perspectives and needs of each stakeholder regarding the management of Lake Wairarapa

Stakeholder perspectives and needs in Wairarapa can vary for several complex reasons that stem from political, ecological, economic, and cultural interests. To identify the different interests, our team will conduct interviews and focus groups. The interviews will target the leaders, professionals, and experts in the following organizations: Rangitane, Department of Conservation, Farmers, and South Wairarapa District Council. The focus groups will target cultural experts and general members of the Rangitane. Below, Figure 20 illustrates the combination of methods we will use to better understand each stakeholder group. This study aims to gather the stakeholder points of view so that our team may present their views in a means that is most valuable to the public and Greater Wellington Regional Council.

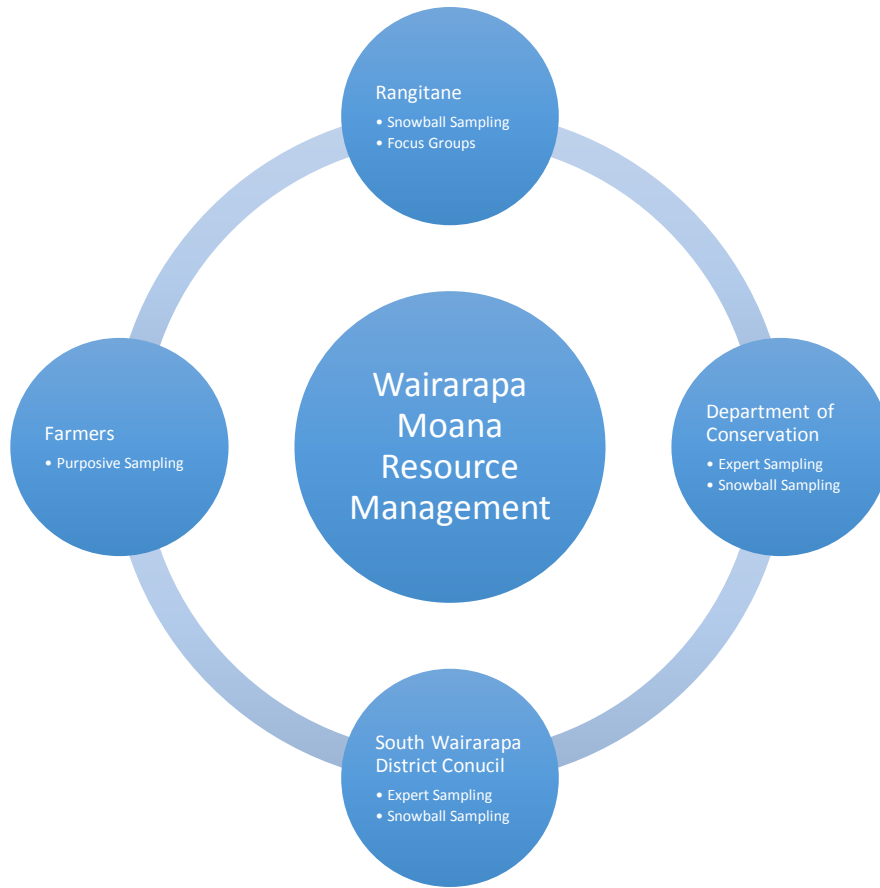


Figure 20: Stakeholder groups and methods

3.3.1 Rangitane

The Rangitane Iwi, headquartered in Masterton, has cultural interests in Wairarapa Moana that stem from their heritage, livelihood, and values. Although we researched their past interests, it is important to reevaluate their current interests and investigate how they would like the Greater Wellington Regional Council to manage the lake. To identify the tribe’s resource management preferences, we will prepare both interviews and focus groups to gather many perspectives on the topic.

The major research objective of the Rangitane interviews is to collect the points of view of as many tribal leaders, experts, and general members as possible within four week period from January 18th to February 19th. The Rangitane interview protocol, shown in Appendix D, describes the goals, planning, and questions for each interview with the Rangitane. The protocol describes setting up interviews from a list given to us by Ian Gunn and using snowball sampling to grow our sample size. In each interview, the guiding principle is to respect the Rangitane and work with them to understand their attitudes toward resource management in Wairarapa Moana.

The goal of conducting focus groups is to broaden our representation of the Rangitane perspective. This research plans to use the focus group protocol and questions in Appendix E. The questions are open-ended and designed to develop a safe discussion on the resource management conflict. We will select participants for the focus groups by working closely with Ian Gunn and the tribal liaison when we arrive. Two members of our team will run the focus groups which will consist of various Rangitane members in groups of six to twelve.

At the conclusion of conducting all interviews and focus groups, the results from the individual interviews will combine with the findings from the focus groups. We will code the information based on common patterns to formulate a Rangitane consensus. This is important for the resource consent renewal in 2019, especially if the Office of Treaty Settlements closes the Rangitane claim, WAI 175, before the process begins.

3.3.2 Department of Conservation

The Department of Conservation is the national organization tasked with preserving New Zealand's natural resources. To determine the DoC's wishes for the management of Lake Wairarapa, we will conduct semi-structured interviews with both leaders and experts regarding the environmental concerns of Wairarapa Moana.

Many of New Zealand's professional and expert ecologists are part of the Department of Conservation. To evaluate and suggest potential lake management solutions, we must first interview these specialists. The interview protocol, attached in Appendix F, explains our sampling, questioning, and goals for interviewing the DoC. The main objective of interviewing the DoC is to develop an understanding of the ecological interests in the region. Technical questions will add to the open-ended questions listed in the interview protocol after we speak with the GWRC. Through expert and snowball sampling techniques, we hope to gather many opinions within the DoC on flood levels, water quality, native species, and the resource consent. This categorization may illuminate the prevalent ecological interests within the DoC and become useful in our analysis.

3.3.3 South Wairarapa District Council

The South Wairarapa District Council is the local governing body consisting of an executive council, three different community boards, and a Maori standing committee. They are

concerned with maintaining the economy within the South Wairarapa region. We will determine the viewpoints of this stakeholder through semi-structured interviews with all branches of the council.

The protocol and questions for these interviews are found in Appendix G. To identify the major economic and political interests in Wairarapa Moana with regard to the resource consent renewal, the interviews will include both open-ended and technical questions. Sampling will target council members, community board members, and members of the Maori standing committee in order to gather the essential information pertaining to the interests of the council. Tailored interview questions will uncover how these individuals view the current flood protection scheme and how changes could benefit the local community. We will collect the SWDC's responses on implications of a management solution in order to develop an overview of their concerns and generate a stakeholder analysis.

3.3.4 Farmers around Ruamahanga Cutoff

We expect the farmers near the Ruamahanga cutoff to have different opinions compared to the other stakeholders because of their close proximity to the lake. Using purposive sampling, Ian Gunn will determine a list of farmers to interview. Structured interviews will help accurately determine the farmers' opinions. To collect thoughts regarding the barrage gate operation, the team developed questions that prompt their opinions on the resource consent. The interview protocol and questions listed in Appendix H will illuminate how the farmers feel about the current flood protection scheme and whether or not they would like to see changes in the upcoming resource consent renewal. Determining the overall attitude of this subset of farmers will facilitate understanding their point of view and gauge how willing they are collectively to compromise with the other stakeholders.

3.4 To evaluate potential consequences of different lake management solutions

Our project must consider the future implications of different options for managing Wairarapa Moana. In 2019, the Greater Wellington Regional Council needs to renew the resource consent, which details the management of the Lower Wairarapa Valley Development

Scheme. To assist the GWRC, we will consider any potential solutions proposed by the stakeholders and analyze their effects on the region. We will accomplish this by using the output from coding the interviews, and performing a cause and effect analysis.

Establishing overview of stakeholder interests is essential for the resource consent application. By coding the interviews we can determine the most frequent interests and desires amongst stakeholders. Categorizing this will reveal a set of constraints used to rule out certain lake management solutions. It is important that we consider the impact of these schemes on all stakeholders.

We must also consider the interest and influence of each perspective stakeholder by conducting a stakeholder analysis. Interview responses will determine the stakeholder's interest and the information gathered from the Office of Treaty Settlements and the Greater Wellington Regional Council will determine the party's influence. We should give stakeholders with the most interest and influence in the region a great deal of consideration when developing a solution for the resource consent.

A number of our interview questions ask about potential lake management options. We will conduct a cause and effect analysis determining the consequences of each solution proposed during the interviews. Solutions suggested by stakeholders are not always plausible and it's necessary to analyze each option while considering the concerns of everyone. In our findings and analysis, we will propose the most appropriate barrage gate regime for each respective stakeholder. We will deliver this information to the GWRC in a report and presentation. We hope this helps the Greater Wellington Regional Council's development of a resource consent application in 2019 that appropriately addresses flood prevention and stakeholder interests.

3.5 Important Considerations

It is important to acknowledge that we are an external party and the local community should sponsor and address solutions for the resource management issue. Asset Based Community Development (ABCD) describes this idea, which explains that local groups should not be subject to a heavy outside influence on matters that concern their own community (Northwestern University, n.d.). It is not within the scope of our project to offer suggestions regarding the lake management. Information gathered from interviews and focus groups will be objectively presented in our analysis to the GWRC. The GWRC will ultimately use this

information to attempt to build a consensus when applying for the resource consent. We will report the findings from each group fairly and accurately in order to remain unbiased and to not promote any specific group's agenda.

The Maori have a long history of outsiders disregarding their rights and cultural beliefs. Therefore, awareness is important when conducting discussions and interviews (Grant, 2012). We will respect their practices and be mindful of any cultural differences. There is a potential language barrier specifically regarding the pronunciation of the Maori words. We will pay special attention to speaking correctly and thoughtfully during interviews. It is important to learn the Maori pronunciation of words and to understand basic cultural cues in order to have effective interviews and a successful project.

Works Cited

- Airey, S., Puentener, R., & Rebergen, A. (2000). *Lake Wairarapa wetlands action plan 2000 - 2010*. Department of Conservation. Retrieved from http://www.gw.govt.nz/assets/council-reports/Report_PDFs/2005_617_3_Attachment.pdf
- Beadel, S., Perfect, A., Rebergen, A., & Sawyer, J. (2000). Wairarapa Plains Ecological District. Retrieved from <http://www.doc.govt.nz/Documents/getting-involved/landowners/wairarapa-plains-pna.pdf>
- Bunny, T., Perrie, A., Milne, J., & Keenan, L. (2014). Lake water quality in the Ruamāhanga Whaitua. Retrieved from <http://www.gw.govt.nz/assets/Plans--Publications/Regional-Plan-Review/Whaitua/Lakewaterqualitysummary.pdf>
- Crombie, N. (25 September 2015). Iwi feud over whakapapa simmers. New Zealand Herald. Retrieved from http://m.nzherald.co.nz/wairarapa-times-age/news/article.cfm?c_id=1503414&objectid=11518697.
- DairyNZ. (2013). New Zealand Dairy Statistics 2012-2013. Retrieved From <http://www.lic.co.nz/user/file/DAIRY%20STATISTICS%202012-13-WEB.pdf>
- Department of Conservation. (n.d.). About us. Retrieved from <http://www.doc.govt.nz/about-us/>
- Department of Conservation. (1996). Conservation Management Strategy Volume 1. Retrieved from <http://www.doc.govt.nz/Documents/about-doc/role/policies-and-plans/wellington-cms/wn-cons-management-strategy.pdf>
- Department of Conservation & the Greater Wellington Regional Council. (2015). Wairarapa Moana Ecological Restoration Plan. Courtesy of Ian Gunn.
- Durie, M., & Durie, M. (2014). Story: Rangitane. *Te Ara - the Encyclopedia of New Zealand*. Retrieved From <http://www.teara.govt.nz/en/rangitane/page-1>
- Edwards, R. (Ed.) (2000). *The hidden river in riparian areas*. College of Forest Resources. Retrieved from <http://ohioline.osu.edu/ls-fact/0001.html>
- Family Health International. (2009). Qualitative Research Methods: A Data Collector's Field Guide (Vol. Module 2: Participant Observation). Retrieved from <http://www.techsociety.com/cal/soc190/fssba2009/ParticipantObservation.pdf>
- Flack, J.(n.d.). Restoring our wetland treasure - a combined vision for Wairarapa Moana. *Greater Wellington Regional Council*. Retrieved from <http://waiwetlands.org.nz/assets/WairarapaMoana/History--Culture/RestoringOurWetlandTreasure.pdf>

- Gorden, R. (1992). Basic Interviewing Skills. *F.E. Peacock*. Retrieved from http://www.indiana.edu/~educy520/sec5982/week_5/qual_data_analy_ex2.pdf
- Grant, I. (2012). Wairarapa Moana, The lake and its people. Masterton: Wairarapa Archive : Fraser Books.
- Grapes, R., & Downes, G. (1997). The 1855 Wairarapa, New Zealand, Earthquake - Analysis of Historical Data. *New Zealand Society for Earthquake Engineering Inc.* Retrieved from [http://www.nzsee.org.nz/db/Bulletin/Archive/30\(4\)0271.pdf](http://www.nzsee.org.nz/db/Bulletin/Archive/30(4)0271.pdf)
- Greater Wellington Regional Council. (2015). Greater Wellington's role and functions. Retrieved from <http://www.gw.govt.nz/greater-wellington-s-role-and-functions/>
- Greater Wellington Regional Council. (2014). Lower Wairarapa Valley Development Scheme. Retrieved from <http://www.gw.govt.nz/lower-wairarapa-valley-development-scheme>
- Greenberg, E. (2014). The Lake Wairarapa National Water Conservation Order. *Greater Wellington Regional Council*. Retrieved from <http://www.gw.govt.nz/assets/Ruamahanga-Whaitua/WGNDOCS-1420976-v5-REPORTTheLakeWairarpaNationalWaterConservatio....pdf>
- Haines, P. E. (2008). ICOLL Management: Strategies for a sustainable future: BMT WBM Pty Ltd, Broadmeadow NSW. Retrieved from http://media.bmt.org/bmt_media/resources/107/icoll_management_3.pdf
- Harding, J. (2013). Qualitative Data Analysis from Start to Finish. Sage Publications Ltd. Retrieved from <https://us.sagepub.com/en-us/nam/qualitative-data-analysis-from-start-to-finish/book235178>
- Hicks, B. J. (1993). Investigation of the fish and fisheries of the Lake Wairarapa wetlands. *New Zealand Ministry of Agriculture and Fisheries*. Retrieved from <http://docs.niwa.co.nz/library/public/NZffmr126.pdf>
- Lambert, G. (n.d.). Ancient Forest. *Olympic National Park*. Retrieved from <http://olympicnationalparkvisitor.info/plants-animals-birds/ancient-forest/>
- Marshall, C., & Rossman, G. B. (1999). Designing Qualitative Research (3rd ed.). Sage Publications. Retrieved from <http://www.jeffreylonghofer.com/resources/Dissertation-Seminar/Required-Readings-PDFS/building-the-conceptual-framework.pdf>
- Moose Pond Association. (n.d.). Milfoil at Songo Locks [image]. Retrieved from <http://www.moosepondassociation.org/Songo Locks Milfoil.html>
- Miller, N. J. (1975). *Brief Review of the Water Resources of the Wairarapa Valley*. National Institute of Water and Atmospheric Research. Retrieved from <http://docs.niwa.co.nz/library/public/MilNJBrie.pdf>

- Ministry of Primary Industries. (2012). New Zealand Shortfin and Longfin Eels [image] Retrieved from <http://www.fish.govt.nz/en-nz/Recreational/Most%20Popular%20Species/Eels/default.htm>
- Nana, G., Leung-Wai, J., Stokes, F., Norman, D. (2008) Economic Profile and Projections for the Wairarapa Region. *BERL Economics*. Retrieved from http://www.wairarapachamber.co.nz/PicsHotel/WairarapaCOC/Brochure/Wairarapa%20District%20Profile%20Performance%20and%20Projections_Final%20Report.pdf
- New Zealand Birds. (2015). New Zealand Dabchick [image]. Retrieved from <http://nzbirdsonline.org.nz/species/new-zealand-dabchick>
- Northwestern University. (n.d.). What is Asset Based Community Development (ABCD). *The Asset Based Community Development Institute*. Retrieved from [http://www.abcdinstitute.org/docs/What%20isAssetBasedCommunityDevelopment\(1\).pdf](http://www.abcdinstitute.org/docs/What%20isAssetBasedCommunityDevelopment(1).pdf)
- Office of Treaty Settlements. (2014). Agreement in Principle to Settle Historical Claims. New Zealand. Retrieved from <https://www.govt.nz/treaty-settlement-documents/rangitane-o-wairarapa-and-rangitane-tamaki-nui-a-rua/>
- Orange, C. (2012). Story: Treaty of Waitangi. *Te Ara - Encyclopedia of New Zealand*. Retrieved from <http://www.teara.govt.nz/en/treaty-of-waitangi/page-1>
- Potangaroa, J. (2012). Origins and early occupation in the Wairarapa. *Rangitane o Wairarapa*. Retrieved from <http://www.rangitane.iwi.nz/publications/>
- Rangitane o Wairarapa. (n.d.) An Introduction To The History Of Rangitane o Wairarapa. Retrieved from <http://www.rangitane.iwi.nz/publications/>
- Rangitane o Wairarapa. (2014) The WAI 175 journey so far. Retrieved from <http://www.rangitane.iwi.nz/treaty/the-wai-175-journey-so-far/>
- Rgbstock. (2010). Manuka flowers [image]. Retrieved from <http://www.rgbstock.com/bigphoto/mjYF0oW/Manuka%20flowers>
- Roberson, H. (1991). Lake Wairarapa Wetlands Management Guidelines. *Department of Conservation*. Retrieved from http://www.gw.govt.nz/assets/council-reports/Report_PDFs/2005_617_2_Attachment.pdf
- Romm, N. (2015). Conducting Focus Groups in Terms of an Appreciation of Indigenous Ways of Knowing: Some Examples from South Africa. Retrieved from <http://www.qualitative-research.net/index.php/fqs/article/view/2087/3731>

- Royal, C. (2011). Cultural Values for Wairarapa Waterways Report. *Ohau Plants Ltd*. Retrieved from <http://www.gw.govt.nz/assets/Our-Environment/Environmental-monitoring/Cultural-Values-for-Wairarapa-Waterways-report.pdf>
- Schmeer, K. (n.d.). Stakeholder Analysis Guidelines: *World Health Organization*. Retrieved from <http://www.who.int/workforcealliance/knowledge/toolkit/33.pdf>
- South Dakota Birds. (n.d.). Greater Scaup [image]. Retrieved from http://sdakotabirds.com/species_photos/greater_scaup.htm
- South Wairarapa District Council. (n.d.). For Visitors. Retrieved from <http://www.swdc.govt.nz/for-visitors>
- Statistics New Zealand. (2002). New Zealand Census of Population and Dwellings, 2001. *Statistics New Zealand*. Retrieved from <http://www.stats.govt.nz/census/2001-census-data/2001-census-of-population-and-dwellings.aspx>
- Texas A&M Agrilife Extension. (n.d.). American Pondweed [image]. Retrieved from <http://aquaplant.tamu.edu/plant-identification/visual-index/american-pondweed/>
- Trochim, W. M. K. (2006). Nonprobability Sampling. *Research Methods Knowledge Base*. Retrieved from <http://www.socialresearchmethods.net/kb/sampon.php>
- Wairarapa Moana Incorporation. (n.d.). Wairarapa Moana Incorporation Waitangi Tribunal Treaty Claim. Retrieved from <http://www.wairarapamoana.org.nz/page75857.html>
- Watts, L., & Perrie, A. (2007). Lower Ruamahanga River instream flow assessment. *Greater Wellington Regional Council*. Retrieved from <http://www.gw.govt.nz/assets/council-publications/lower%20ruamahanga%20river%20instream%20flow%20assessment%20report%20screen%20version.pdf>
- Young, R., Smart, G., & Harding, J. S. (2004). Impacts of hydro-dams, irrigation schemes and river control works. In: Harding, J.S., Mosley, P., Pearson, C. and Sorrell, B. (editors). *Freshwaters of New Zealand*. New Zealand Limnological and Hydrological Societies, Christchurch. Retrieved from https://www.researchgate.net/publication/238668681_Chapter_37_Impacts_of_hydro-dams_irrigation_schemes_and_river_control_works

Appendix A – Conservation Management Strategy for Wellington

Conservation Management Strategy for Wellington 1996-2005 (DoC, 1996)

LAKE WAIRARAPA WETLANDS – OBJECTIVES

1. Conservation of the ecological, historical and landscape values
2. Consultation with iwi/hapu to identify their management objectives and the protocols necessary to maintain the area's historical and cultural integrity
3. Integrated management of the Lake Wairarapa wetlands and their catchments to protect conservation values within the wetland area
4. Provision of passive recreation opportunities and interpretation of the natural and historic resources.

Appendix B – Office of Treaty Settlements Interview Protocol

Overview:

What: Interview with the Office of Treaty Settlements. This interview will focus on gaining information about the current state of the settlement and how the process will proceed in the future, concerning overlapping settlement claims. This interview process will include all of the four members of the group.

Type of Interview: Semi-structured interview

Sampling: Availability sampling and Snowball sampling

Goals of the interview: To understand treaty settlement with the Rangitane and the overlapping claims process.

Planning Details:

Video/Sound Recorded: No

Where: Office of Treaty Settlements, Level 3, The Justice Centre
19 Aitken Street
Wellington 6011
New Zealand

When: TBD

With Whom: Availability Sampling- determined when arriving on site.

Roles:

Introduce the Team: TBD

Facilitate/Ask questions: TBD

Take notes: TBD

Summarize the interview: TBD

Review notes and revise: TBD

Send to interviewee: TBD

Interview Questions:

- What is your job title?
- Can you describe the activities you do for your organization? What is your involvement with the treaty settlement process?
- Have you had any involvement specifically with the Rangitane Settlement process?
- Can you explain how statutory acknowledgements, mentioned in the settlement process, function and how groups would proceed under this arrangement?
- What's the status of the treaty settlement process for the Rangitane?
- Can you describe the process for settling overlapping claims?
- When do you believe the Crown will finalize overlapping claims between the two iwi (Rangitane and Kahungunu)?
- Will the overlapping claims result in a reduction in the financial and commercial redress money for the Rangitane?

Notes: Insight into the settlement process may lead to additions and edits of objective 2 questions. The treaty settlement will influence the amount of political power the Rangitane have

regarding the issue. If the Crown does not finalize the settlement, we may need to employ a new strategy to interview the Rangitane because of their unwillingness to discuss.

Appendix C – Greater Wellington Regional Council Interview Protocol

Overview:

What: The team will facilitate these interviews

Type of Interview: Open-ended interview

Sampling: Availability sampling and Snowball sampling

Goals of the interview: To understand lake management, resource consent process, and the region.

Planning Details:

Video/Sound Recorded: No

Where: Masterton, Upper Hutt, and Wellington

34 Chapel Street PO Box 41 Masterton 5840	1056 Fergusson Drive PO Box 40847 Upper Hutt 5018	Shed 39 PO Box 11646 Wellington 6142
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When (date and time): TBD

With Whom: Targeting resource consent team, GWRC flood prevention dept, and experts in the field

Roles:

Introduce the Team: Ian Gunn

Facilitate/Ask questions: TBD

Take notes: TBD

Summarize the interview: TBD

Review notes and revise: TBD

Send to interviewee: TBD

Interview Questions:

- Where do you live (city and region)?
- How long have you lived in New Zealand?
- Can you describe your activities within the GWRC?
- Can you describe your rank and position in the GWRC?
- Can you explain how the GWRC interacts with the Maori?
- Can you explain the economy of Wairarapa Moana and whether it is changing?
- Can you explain how politics and elections work in Wairarapa Moana?
- Can you explain the GWRC interests and influence in Wairarapa Moana?
- Can you explain how the GWRC operation facility operates the barrage gates?
- How much flexibility is there with respect to the operation of the barrage gates?
- Can you explain how the GWRC manages the Lake Onoke spit?

Notes: Questions are to better our understanding of the background of the region and stakeholders.

Appendix D – Rangitane Interview Protocol

Overview:

What: 2-4 people will conduct these interviews. They will involve gaining information about the points of view of the Rangitane concerning the Management of Lake Wairarapa.

Type of Interview: Semi- structured interview

Sampling: Snowball Sampling

Goals of the interview: Understand opinions about region, how involved they are, what they would like to see happen to the region, what they value most

Planning Details:

Video/Sound Recorded: Yes, ask for interviewee consent first

Where: Masterton office

When (date and time): TBD

With Whom: Kaumatuas (elders), cultural advisors, and iwi members

Roles:

Introduce the Team: Ian Gunn

Facilitate/Ask questions: TBD

Take notes: TBD

Summarize the interview: TBD

Review notes and revise: TBD

Send to interviewee: TBD

Interview Questions:

- Demographic
 - What do you do for a living?
 - Where do you live (city and region)?
 - How long have you lived in the Wairarapa region?
 - Can you describe your role in your tribe?
 - How have you been involved with the Treaty Settlement Process?
 - How does Wairarapa Moana provide for your needs?
- Knowledge
 - What do you know about water quality in Lake Wairarapa?
 - What do you know about flooding in Wairarapa?
 - What do you know about the native fish?
 - What do you know about the Lower Wairarapa Valley Development Scheme?
 - What do you know about the Barrage Gates?
 - What do you know about the Ruamahanga cutoff?
 - Are you aware of any agencies currently involved with the conservation efforts around Lake Wairarapa?
 - What do you know about the barrage gate resource consent?
 - Are you aware that the Barrage Gates resource consent expires in 2019?
 - Can you explain the cultural values of Wairarapa Moana?
- Perceptions (Current)

- What do you value most about Wairarapa Moana? Why?
- What is your biggest complaint with the current flood prevention scheme?
- What advantages are there with the current flood prevention scheme?
- What disadvantages are there with the current flood prevention scheme?
- What would you like to happen with Wairarapa Moana land? Why?
- How important to you are conservation efforts regarding Lake Wairarapa?
- What are your opinions about the barrage gates?
- What are your views on irrigation in the region?
- Do you think there is a need for anti-pollution measures to be taken? Please specify.
- Do you think flooding is a major issue in the region? Does flooding affect you? Is flooding well-managed?
- What issues regarding the flood prevention scheme do you think are important? Please elaborate. (water quality, flood levels, irrigation, native fish)
- Please rank the issues that have arisen from the flood prevention scheme based on their importance.
- Perceptions (Future)
 - How could the barrage gates be operated in the future to suit your needs?
 - What do you think would be a reasonable compromise regarding the barrage gates?
 - What is the biggest issue to address in the future regarding the flood prevention scheme?

Notes: Respect and carefulness is absolutely necessary to not offend the Maori. After speaking to the Office of Treaty Settlements, we will add technical questions to better gather an understanding of the ecological and cultural interests.

Appendix E – Rangitane Focus Group Protocol

Overview:

What: Two people will conduct these interviews and they will involve gaining information about the points of view of the general members of the Rangitane iwi concerning the Management of Lake Wairarapa.

Goals of the Focus Group: Facilitate discussion within the Rangitane to understand opinions about region, how involved they are, what they would like to see happen to the region, and what they value most.

Planning Details:

Video/Sound Recorded: Yes, ask for participant consent first

Where: Masterton office

When (date and time): TBD

With Whom: Contact liaison. Set up focus groups of 6-12 of Rangitane general members.

Roles:

Introduce the Team: Ian Gunn

Facilitate/Ask questions: TBD

Take notes: TBD

Summarize the interview: TBD

Focus Group Questions:

- Demographic
 - Can you describe your role in your tribe?
- Perceptions
 - What do you value most about Wairarapa Moana? Why?
 - What is your biggest complaint with the current flood prevention scheme?
 - What issues regarding the flood prevention scheme do you think are important? Please elaborate. (water quality, flood levels, irrigation, native fish)
 - How could the barrage gates be operated in the future to suit your needs?
 - What do you think would be a reasonable compromise regarding the barrage gates?

Appendix F – Department of Conservation Interview Protocol

Overview:

What: This study will involve interviewing the Department of Conservation, two group members per interview, in order to understand how they feel about a variety of issues regarding the barrage gates.

Type of Interview: Semi-Structured

Sampling: Expert Sampling and Snowball Sampling

Goals of the interview: Determine the DoC's overall stance regarding the barrage gate resource consent renewal by talking to DoC executives. Determine environmental impact of the gates by talking to DoC ecology experts.

Planning Details:

Video/Sound Recorded: Yes, ask for interviewee consent first

Where: Masterton DoC Office

220 South Road

Masterton 5810

When (date and time): TBD

With Whom: Targeting the executive members for the organization as well as experts on Wairarapa ecology.

Roles:

Introduce the Team: TBD

Facilitate/Ask questions: TBD

Take notes: TBD

Summarize the interview: TBD

Review notes and revise: TBD

Send to interviewee: TBD

Interview Questions:

- Demographic
 - What do you do for a living?
 - Where do you live (city and region)?
 - What is your role within Department of Conservation?
 - Does the operation of the barrage gates have any impact on your or DoC activities? If so in what way?
 - How specifically does DoC use the water in the Wairarapa water system?
 - What role does DoC have in the Treaty Settlement Process?
 - Do you or your department have a resource consent in Wairarapa? If so can you explain?
 - Do you utilize either the Cutoff or the lower Ruamahanga River for recreational activities?
- Knowledge
 - What do you know about water quality in Lake Wairarapa?
 - What do you know about flooding in Wairarapa?

- What do you know about the native fish?
- What do you know about the Lower Wairarapa Valley Development Scheme?
- What do you know about the Barrage Gates?
- What do you know about the Ruamahanga cutoff?
- Can you explain the cultural values of Wairarapa Moana?
- Are you aware of any agencies currently involved with the conservation efforts around Lake Wairarapa?
- What do you know about the barrage gate resource consent?
- Are you aware that the Barrage Gates resource consent expires in 2019?
- Can you explain the cultural values of Wairarapa Moana?
- Perception
 - What does DoC value most about Wairarapa Moana?
 - What do you know about the Resource Consent Renewal regarding the operation of the barrage gates in 2019?
 - What advantages are there with the current setup?
 - What disadvantages are there with the current setup?
 - What would you like to happen with Wairarapa Moana land? Why?
 - How important to you are conservation efforts regarding Lake Wairarapa?
 - How would you like to see the Barrage gates operated?
 - Is Wairarapa Moana a valued cultural resource?
 - Do you think there is a need for anti-pollution measures to be taken? Please specify.
 - Do you think flooding is a major issue in the region? Does flooding affect you? Is flooding well-managed?
 - What issues regarding the flood prevention scheme do you think are important? Please elaborate. (water quality, flood levels, irrigation, native fish)
 - Please rank the issues that have arisen from the flood prevention scheme based on their importance.
 - What would you suggest be a reasonable solution regarding the barrage gates that could address the needs of the region?

Notes: After speaking to the GWRC, we will add technical questions to better gather an understanding of the ecological and cultural interests.

Appendix G – South Wairarapa District Council Interview Protocol

Overview:

What: This will involve interviews with the South Wairarapa District Council and each of their three branches. The SWDC governs the entire South Wairarapa Region and will be able to explain where the interests of the public are regarding the barrage gates. We plan to hear a wide variety of responses from this group because of the broad range of representation (from Maori to Councilors).

Type of Interview: Semi-Structured

Sampling: Expert Sampling and Snowball Sampling

Goals of the interview: To determine the perspectives and needs of the public in the South Wairarapa Region and where different members of the SWDC stand regarding the issue.

Planning Details:

Video/Sound Recorded: Yes, ask for interviewee consent first

Where: Martinborough

19 Kitchener Street

Martinborough 5711

When (date and time): TBD

With Whom: Targeting the executive members for each branch including Councilors, Community Board Members and Maori Standing Committee Members. We are currently considering interviews with the following committee chairs:

- Council Chair
 - Adrienne Staples
- Community Board Chairs
 - Lee Carter
 - Lisa Cornelissen
 - Shane Atkinson
- Maori Standing Committee Chair
 - Michael Roera

Roles:

Introduce the Team: TBD

Facilitate/Ask questions: TBD

Take notes: TBD

Summarize the interview: TBD

Review notes and revise: TBD

Send to interviewee: TBD

Interview Questions:

- Demographic
 - What do you do for a living?
 - Where do you live (city and region)?
 - What is your role within South Wairarapa District Council?

- Does the operation of the barrage gates have any impact on your or SWDC activities? If so in what way?
- How specifically does SWDC use the water in the Wairarapa water system?
- What role does SWDC have in the Treaty Settlement Process?
- Do you or your department have a resource consent in the district? If so can you explain?
- Do you utilize either the Cutoff or the lower Ruamahanga River for recreational activities?
- Knowledge
 - What do you know about water quality in Lake Wairarapa?
 - What do you know about flooding in Wairarapa?
 - What do you know about the native fish?
 - What do you know about the Lower Wairarapa Valley Development Scheme?
 - What do you know about the Barrage Gates?
 - What do you know about the Ruamahanga cutoff?
 - Can you explain the cultural values of Wairarapa Moana?
 - Are you aware of any agencies currently involved with the conservation efforts around Lake Wairarapa?
 - What do you know about the barrage gate resource consent?
 - Are you aware that the Barrage Gates resource consent expires in 2019?
 - Can you explain the cultural values of Wairarapa Moana?
- Perception
 - What does SWDC value most about Wairarapa Moana?
 - What advantages are there with the current setup?
 - What disadvantages are there with the current setup?
 - What would you like to happen with Wairarapa Moana land? Why?
 - How important to you are conservation efforts regarding Lake Wairarapa?
 - How would you like to see the Barrage gates operated?
 - Is Wairarapa Moana a valued cultural resource?
 - Do you think there is a need for anti-pollution measures to be taken? Please specify.
 - Do you think flooding is a major issue in the region? Does flooding affect you? Is flooding well-managed?
 - What issues regarding the flood prevention scheme do you think are important? Please elaborate. (water quality, flood levels, irrigation, native fish)
 - Please rank the issues that have arisen from the flood prevention scheme based on their importance.
 - What would you suggest be a reasonable solution regarding the barrage gates that could address the needs of the region?

Notes: After speaking to the GWRC, we will add technical questions to better gather an understanding of the economic and political interests.

Appendix H – Farmer Interview Protocol

Overview:

What: This study will involve each of our group members, four in total, interviewing farmers around the Ruamahanga Cutoff and barrage gates to understand their point of view on Wairarapa Moana resource management.

Type of Interview: Structured interview

Sampling: Purposive sampling

Goals of the interview: Identify needs and perspectives of these specific farmers.

Planning Details:

Video/Sound Recorded: Yes, ask for interviewee consent first

Where: Around Lake Wairarapa

When (date and time): TBD

With Whom: List of farmers provided by Ian Gunn

Roles:

Introduce the Team: TBD

Facilitate/Ask questions: TBD

Take notes: TBD

Summarize the interview: TBD

Review notes and revise: TBD

Send to interviewee: TBD

Interview Questions:

- Demographic
 - Can you describe your farming activities and lifestyle?
 - How long have you lived in the Wairarapa region?
 - How involved are you with politics?
 - How does Wairarapa Moana provide for your needs?
- Knowledge
 - What do you know about water quality in Lake Wairarapa?
 - What do you know about flooding in Wairarapa?
 - What do you know about the native fish?
 - What do you know about the Lower Wairarapa Valley Development Scheme?
 - What do you know about the Barrage Gates?
 - What do you know about the Ruamahanga cutoff?
 - Can you explain the cultural values of Wairarapa moana?
 - Are you aware of any agencies currently involved with the conservation efforts around Lake Wairarapa?
 - What do you know about the barrage gate resource consent?
 - Are you aware that the Barrage Gates resource consent expires in 2019?
 - Can you explain the cultural values of Wairarapa moana?
- Perceptions (Current)
 - What do you value most about Wairarapa Moana? Why?

- What is your biggest complaint with the current flood prevention scheme?
- What advantages are there with the current flood prevention scheme?
- What disadvantages are there with the current flood prevention scheme?
- What would you like to happen with Wairarapa Moana land? Why?
- How important to you are conservation efforts regarding Lake Wairarapa?
- What are your opinions about the barrage gates?
- What are your views on irrigation in the region?
- Do you think there is a need for anti-pollution measures to be taken? Please specify.
- Do you think flooding is a major issue in the region? Does flooding affect you? Is flooding well-managed?
- What issues regarding the flood prevention scheme do you think are important? Please elaborate. (water quality, flood levels, irrigation, native fish)
- Please rank the issues that have arisen from the flood prevention scheme based on their importance.
- Perceptions (Future)
 - How could the barrage gates be operated in the future to suit your needs?
 - What do you think would be a reasonable compromise regarding the barrage gates?
 - What is the biggest issue to address in the future regarding the flood prevention scheme?

Notes: After speaking to the GWRC, we will add technical questions to better gather an understanding of the economic and political interests.