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All reasonable endeavours have been undertaken to ensure this information is the best information possible at the time of preparation. This does not warrant that the information is current, complete or accurate. Subsequent versions will include new information as it comes to hand.

Waiau Catchment Values:

What do we currently know?

1. Ki uta ki tai (from mountains to sea)

Environment Southland seeks to manage water and land resources in a way that reinforces the Ngāi Tahu philosophy of 'ki uta ki tai' (from mountains to sea). This integrated approach gives reference to the understanding of the natural world and the belief that all things are connected.

While being founded on traditional values and understanding, ki uta ki tai is also a modern management framework that involves the creation of a number of tools, such as natural resource management plans, monitoring, and resource inventories to address the continuing challenges and threats faced by all aspects of the natural environment from the mountains to the sea – ki uta ki tai. This approach recognises that Environment Southland is committed to managing the connections between people, land and water, including the effects of water quality and quantity on the health and function of estuaries and coastal lagoons.

2. The catchment setting

<i>Key topographic features:</i>	Franklin, Stuart, Murchison, Livingston, Earl, Takitimu, Kepler, Hunter, Townley, Wall and Wick Mountains, Longwood Ranges, Mount Titiroa, Mount Mavora, Moffat Peak, Cleughearn Peak, Black Mount
<i>Major towns:</i>	Tuatapere, Manapōuri, Te Anau, Ohai
<i>Major rivers & streams:</i>	Waiau River, Eglington River, Mararoa River, Upukerora River, Holly Burn, Borland Burn, Saddle Creek, Waimotu Creek
<i>Lakes:</i>	Monowai, Manapōuri, Te Anau, North Mavora, South Mavora, Green, Erskine, Hankinson, Clark, Waphti, Mclvor, Thomson, Wade, Bloxham, Wisely, Duncan, Te Au, Hilda, Hall, Eve, Mineva, Freeman, Herries, Annie, Eyles, Trinity, Lois, Rakatu, St Patrick, Green, Island, Shallow, Jaquierey, Thomas, Te Aroha, Bog, Asheron, Iceberg, Ross, Bronlee, Roxburgh, Sutherland, Hankison
<i>Aquifers:</i>	Te Waewae, Te Anau and Blackmount Groundwater Zones
<i>Estuaries:</i>	Te Waewae (Waiau) Lagoon

Geography and brief human history

The Waiau catchment originates in the Stuart, Franklin, Earl and Livingstone Mountains to the north, extending southward past Lakes Te Anau and Manapōuri to follow the trajectory of the Waiau River to its outflow in Te Waewae Bay. The catchment extends across elevated forest in the north and the east, and southward toward lowland plains around the lower Waiau basin.

The Waiau catchment, in combination with the Te Waewae Bay western coastal zone catchment, make up the Waiau – Waiau Lagoon Freshwater Management Unit for the purposes of Environment Southland’s management of land and water resources.

Māori nohoanga (seasonal camps) used to be common on the banks of the Waiau River and throughout the catchment, with people moving along the Foveaux coast into Fiordland and the Waiau district to the kaika (villages) and nohoanga of the inland lakes. The area was rich in resources and includes many favoured mahinga kai.

The inland lakes were an important stopping point between te ara tawhito (traditional routes) in Te Waipounamu (South Island). Many European surveyors were guided into the interior by local Māori in the early and mid-1800s, along well-worn routes from the Foveaux coast that were still visible during the land clearances of the 1880s. Large and significant archaeological and artefact collections have been found throughout this catchment. This catchment has a rich and long oral history, beginning from the shaping of the land by Rākaihāutu and the sinking of *Tākitimu*, the waka of Tamatea, at the mouth of the Waimeamea River in Te Waewae Bay.

The mana whenua of Southland are Ngāi Tahu, Kati Mamoe and Waitaha. Te Rūnanga o Ngāi Tahu is the iwi authority and is made up of 18 Papatipu Rūnanga (like regional councils). Every Papatipu Rūnanga can act autonomously and has its own interests, and it is through Papatipu Rūnanga that the collective Ngāi Tahu voice is represented at the local government and community level. The four Papatipu Rūnanga in Southland, are:

- Te Rūnanga o Awarua based at Te Rau Aroha Marae in Bluff;
- Te Rūnanga o Oraka - Aparima based at Takutai o Te Titi Marae in Colac Bay and Riverton/Aparima;
- Waihōpai Rūnanga based at Murihiku Marae in Invercargill; and
- Hokonui Rūnanga, Gore.



There are two major settlements within the Waiau catchment; Tuatapere, and Te Anau. Tuatapere started as a sawmilling centre in the 1880s. As sawmilling declined throughout the 20th century, the town became more orientated to the rural agricultural interests in the region. As nature-based tourism grew in the Southland region towards the latter stages of the 20th century, Tuatapere became a central town along the Southern Scenic Route, which opened in 1988. Te Anau developed as a settlement following the opening of the Homer Tunnel into Milford Sound/Piopiotahi in 1953. It acts as a central hub to the wider north-western Southland community, as well as one of Southland's preeminent tourist destinations. The catchment provides access to prominent tourist attractions for Southland and the wider Waiau Freshwater Management Unit, providing a gateway in the north to the popular Fiordland National Park.

Approximately 5,000 people live rurally and in the four main settlements in the catchment (Te Anau, Manapōuri, Ohai and Tuatapere). The relatively high proportion of people living rurally in these catchments is reflective of Southland and highlights strong urban and rural connections. Most towns are dependent on the economic activity created in their surrounding rural areas, and these rural areas are reliant on the facilities, services, and amenities supplied in their local towns. The catchment also supports domestic and international visitors who explore the recreational and scenic opportunities that the catchment offers, particularly in the northern parts of the catchment around Te Anau and Manapōuri.

Changes to land and water use

Before European settlement, the flat plains all over Southland were covered by bush – mataī, rimu, lowland beech, kānuka and mānuka, interspersed with tussock grasslands, and swamp and bog in low-lying areas. Historical clearance and altered drainage of land for farming and human occupation has since made the area more prone to erosion, with greater and faster water runoff and river flood flows, reduced area of wetlands and riparian habitat, and increased loss of contaminants to waterways (e.g. sediment, nutrients and micro-organisms).

As Te Anau began to experience significant growth after the opening of the Homer Tunnel, land was allocated for building and subdivision. Adjacent to this was the expanding farmland around the area, where intensive aerial top-dressing of the Te Anau basin converted scrubland into productive farmland.

Neighbouring Manapōuri has also experienced dramatic land and water use changes, through construction of the Manapōuri hydroelectric power station. Water is discharged through the electricity generators into Deep Cove, in Doubtful Sound, influencing the lake level and the flow rate of the exiting Waiau River. Further south, Lake Monowai has also been subject to hydroelectric schemes. The lake level was raised by 2m in 1925 to provide a higher flow rate for a power station, which today supplies roughly 5% of Southland's power. Dead trees around its banks remain a visual indication of the lake level rise. As a result the Waiau River flow regime has been altered, which affects the mainstem of the river south to Te Waewae Bay.

Significant conservation protection is now evident within the Waiau catchment area. Major conservation areas in the catchment are Dean Forest, Takitimu, Snowdon Forest, Mavora Lakes, and the Eyre Mountains (Taka Ra Haka). Fiordland National Park borders the catchment to the west, incorporating parts of Lake Te Anau. Specified conservation areas are included within Te Wahipounamu; a UNESCO World Heritage Site inscribed in 1990 for its exceptional and outstanding natural characteristics.

Of the approximately 767,000 hectares of land in the Waiau catchment, the majority (72%) is used for conservation. There is approximately 185,600 ha (24%) of land in farming, most of which is drystock and dairy support. Commercial forestry makes up approximately 19,400 ha (3%) with the remainder of land used for activities like residential and commercial use and transport (e.g. road, rail, airstrips). Approximately 593,100 ha is Department of Conservation estate and approximately 500 ha is Māori freehold land.

There are nohoanga sites within the catchment zone. Nohoanga are specific areas of Crown owned land adjacent to lakeshores or riverbanks, which provide Ngāi Tahu Whānui the opportunity to have temporary, but exclusive rights to pursue traditional food and other resource gathering activities, as given effect through the Ngāi Tahu Claims Settlement Act of 1998. Near Moturau/Lake Manapōuri, Manawapōpōre/Hikuraki/Mavora Lakes and in two sites near Te Ana-Au/Lake Te Anau, there are nohoanga. There are also nohoanga sites beside the Waiau River near Queens Reach, as well as the western and eastern sides of the river mouth. The Waiau River, Manawapōpōre/Hikuraki/Mavora Lakes, Te Ana-Au/Lake Te Anau and Moturau/Lake Manapōuri are Ngāi Tahu Statutory Acknowledgement Areas, which recognises Ngāi Tahu's mana in specific sites and areas, providing for this to be reflected in the management of those areas.

There are approximately 7 water permits for irrigation use, 28 permits for stock water and dairy shed wash down, 16 permits for potable water supplies and 6 permits for commercial activities in the catchment; both surface and groundwater are used.

Ngāi Tahu historical treaty settlement

In 1998, Ngāi Tahu agreed to a redress package from the Crown, including a formal apology, to remedy historical breaches of the Treaty of Waitangi. Mahinga kai is the ninth component of the 'Nine Tall Trees' from the Ngāi Tahu Treaty Claim; an intrinsic part of the iwi identity, and often referred to as the 'DNA of Ngāi Tahu'.

There are also a number of statutory mechanisms that, through the Ngāi Tahu Claims Settlement Act 1998, have been put in place across Southland waterways to recognise the importance and associations with Ngāi Tahu whānui. The recognition of Ngāi Tahu mana, mahinga kai provisions, management input and land ownership mechanisms are provided for in the act and include:

- Statutory Acknowledgements;
- Topuni;
- Nohoanga;
- Customary fisheries;
- Taonga species;
- Dual place names; and
- Tribal properties.

Te Mana o te Wai

Te Mana o te Wai is the integrated and holistic well-being of freshwater bodies. The National Policy Statement for Freshwater Management (NPS-FM) and the proposed Southland Water and Land Plan (pSWLP) recognise that upholding Te Mana o te Wai requires that in using water we must also provide for Te Hauora o te Taiao (the health and mauri of the environment), Te Hauora o te Wai (the

health and mauri of the water) and Te Hauora o te Tangata (the health and mauri of the people). While these three national requirements apply broadly to all freshwater bodies in New Zealand, they encapsulate many kinds of values that we can identify and describe more specifically from an individual waterbody to the wider catchment.

Furthermore the proposed Southland Water and Land Plan has established a policy for recognising and implementing Te Mana o te Wai. Policy 44 states:

Particular regard will be given to the following values, alongside any additional regional and local values determined in the Freshwater Management Unit limit setting process:

- *Te Hauora o te Wai (the health and mauri of water);*
- *Te Hauora o te Tangata (the health and mauri of the people);*
- *Te Hauora o te Taiao (the health and mauri of the environment);*
- *Mahinga kai;*
- *Mahi māra (cultivation);*
- *Wai Tapu (Sacred Waters);*
- *Wai Māori (municipal and domestic water supply);*
- *Āu Putea (economic or commercial value);*
- *He ara haere (navigation).*

The following section is a high-level summary of some of the values understood to apply to the Waiau catchment based on what we know today. These catchment values include the two compulsory national values recognised by the NPS-FM and a list of other values from Te Mana o te Wai (Policy 44).

3. Many kinds of values

Ecosystem health (a compulsory national value)

Ecosystem health is a compulsory national value. In a healthy freshwater ecosystem ecological processes are maintained, there is a range and diversity of indigenous flora and fauna, and there is resilience to change (i.e ecosystems are strong enough to handle stresses). The Waiau catchment supports a range of different ecosystem types including small headwater streams, springs, lowland tributaries and mainstem, wetland, estuary, coastal and groundwater ecosystems.

Ecosystem health can be measured in many ways including aspects of physical habitat, water flow, water quality, biological community composition and ecosystem processes. Because it is impractical to measure everything, indicators are used to assess the overall level of ecosystem health. These indicators include monitoring the health of periphyton (algae) and macroinvertebrate (fish food) communities in rivers and streams, and phytoplankton (microscopic plants) in lakes.

For periphyton there are seven sites in the Waiau catchment that are routinely monitored. This monitoring provides quite detailed information, but in highly summarised terms, most sites are currently graded “very good” or “fair”, with 1 site graded as “good” when tested against national

standards for all river and stream types¹, and three sites "fail" when tested against existing regional plan threshold criteria for nuisance filamentous periphyton. The nuisance and invasive alga didymo is a notable problem in the Waiau catchment where it was discovered for the first time in New Zealand in 2004. This nuisance alga, also known as "rock snot", tends to form worse blooms in rivers with (somewhat unusually) low phosphorus concentrations and stable flow regimes such as those in rivers fed by natural or dammed lakes. Such conditions occur in the mainstem Waiau and several of its tributaries; the nuisance blooms tend to be made worse in sections of river that have more stable flows and less floods (i.e. 'flushing flows') due to damming and flow control for hydroelectric generation. For macroinvertebrates, 14 sites are monitored and most are "good" with one graded as "fair".

The better ecological indicator grades for periphyton and macroinvertebrates tend to occur in the upper catchment (e.g. headwater streams) while lower grades tend to occur in reaches below where land has been modified for human use or where the flows are highly modified. Key contributors to some sites being in lower ecological condition include altered river flow regimes, eroding riverbanks, modified riparian and wetland habitat, as well as elevated levels of nutrients (nitrogen and phosphorus) and sediment, all of which are at least partly attributable to historic and current land uses for human occupation.

Phytoplankton in Lakes Manapōuri and Te Anau are regularly monitored at five sites and in summarised terms, these sites are currently graded as "very good".

Estuaries like the Te Waewae (Waiau) Lagoon are complex ecological systems comprised of a diverse range of habitats such as shallow open water, sandy beaches, salt marshes, intertidal sand and mud flats, coastal wetlands and riparian and landward vegetation. Ecosystem health in estuaries can also be measured in many ways including the extent of mud, nutrients, macroalgae, seagrass and some technical indicators like the redox potential discontinuity which indicates the amount of oxygen in sediments, and the gross eutrophic zone which combines indication of the extent of unhealthy levels of mud, macroalgae and anoxic black sediment. In the Te Waewae (Waiau) Lagoon, there is detailed ecosystem health monitoring available for all these indicators across several sites, but in highly summarised terms it shows that the lagoon is in "fair" condition with regard to oxygen in sediment, but is "poor" on other measures such as nutrients within bed sediment.

Key contributors to lower ecological condition in the Te Waewae (Waiau) Lagoon include the elevated levels of sediment and nutrients that arrive in the estuary from the upstream Saddle Creek, Holly Burn and Waiau River catchments (i.e. eutrophication), historic drainage that has reduced wetland area, grazing of margins, restriction or closing of the mouth of the lagoon to the sea, sea level rise due to the lagoon and coastal plain being low-lying and loss of flushing flows.

Another element of describing ecosystem health is considering the range and diversity of indigenous flora and fauna and their habitats. A range of indigenous invertebrates, fish and birds live in the Waiau catchment, with several of the fish and bird species recognised as threatened. A list of the freshwater fish species known to be present in the catchment, and the conservation status of those species is shown in Table 1.

¹ A four-class grading system is used here including "very good", "good", "fair" and "poor" which approximately relates to the NPSFM national objectives framework bands A, B, C and D respectively. For context the NPSFM establishes national bottom lines for some attributes (measures) of ecosystem health and human health for recreation that mean a regional plan cannot set an objective below "fair" (C Band) for supporting these values.

Table 1: Freshwater fish species known to occur in the Waiau catchment (from records on the New Zealand Freshwater Fish database as at November 2018) and their conservation status

Scientific name	Common name	NZ Threat Classification
<i>Aldrichetta forsteri</i>	Yelloweye mullet	Not threatened
<i>Anguilla australis</i>	Shortfin eel	Not threatened
<i>Anguilla dieffenbachii</i>	Longfin eel	Declining
<i>Anguilla spp.</i>	Unidentified eel	Taxonomically indistinct
<i>Cheimarrichthys fosteri</i>	Torrentfish	Declining
<i>Galaxias argenteus</i>	Giant kokopu	Declining
<i>Galaxias spp.</i>	Unidentified galaxiid	Taxonomically indistinct
<i>Galaxias brevipinnis</i>	Koaro	Declining
<i>Galaxias fasciatus</i>	Banded kokopu	Not threatened
<i>Galaxias gollumoides</i>	Gollum galaxias	Nationally vulnerable
<i>Galaxias maculatus</i>	Inanga	Declining
<i>Galaxias paucispondylus</i>	Alpine galaxias	Naturally uncommon
<i>Galaxias "southern"</i>	Galaxias "southern"	Nationally vulnerable
<i>Geotria australis</i>	Lamprey	Nationally vulnerable
<i>Gobiomorphus breviceps</i>	Upland bully	Not threatened
<i>Gobiomorphus cotidianus</i>	Common bully	Not threatened
<i>Gobiomorphus hubbsi</i>	Bluegill bully	Declining
<i>Gobiomorphus huttoni</i>	Redfin bully	Not threatened
<i>Gobiomorphus spp.</i>	Unidentified bully	Taxonomically indistinct
<i>Hyridella menziesi</i>	Freshwater mussel	Declining
<i>Oncorhynchus mykiss</i>	Rainbow trout	Introduced and naturalised
<i>Paranephrops spp.</i>	Koura	Taxonomically indistinct
<i>Paratya curvirostris</i>	Freshwater shrimp	Nationally vulnerable
<i>Perca fluviatilis</i>	Perch	Introduced and naturalised
<i>Retropinna retropinna</i>	Common smelt	Not threatened
<i>Rhombosolea retiaria</i>	Black flounder	Not threatened
<i>Salvelinus fontinalis</i>	Brook char	Introduced and naturalised
<i>Salmo</i>	Unidentified salmonid	Taxonomically indistinct
<i>Salmo salar</i>	Atlantic salmon	Introduced and naturalised
<i>Salmo trutta</i>	Brown trout	Introduced and naturalised

The area of wetlands in the Waiau catchment are now much smaller than what they were in pre-European times with wetland loss continuing to occur to recent times. It is estimated 94 ha (3%) of wetland area has been lost in the catchment between 2007 and 2015. The remaining wetlands are of high intrinsic and biodiversity value. Examples of wetland areas remaining in the Waiau catchment recognised as being regionally significant include the Dome mire, Dismal swamp, Tekero wetland, Redcliff reserve, Borland mire and Feldwick wetland.

Groundwater systems also support ecosystems containing micro-organisms and tiny animals known as stygofauna that live in the water in the spaces between the gravel and cobbles of aquifers. They have only begun to be studied relatively recently and are thought to play an important role in assimilating nutrients and other contaminants in groundwater, thus also interacting and contributing to the health of groundwater spring-fed ecosystems and downstream river and estuary ecosystems.

Human Health for recreation (a compulsory national value)

In a healthy waterbody, people are able to connect with and contact the water through a range of activities including swimming, various types of boating, fishing and harvesting from within the water. The Waiau River at Tuatapere is identified as a popular bathing site but there are others too. The risk of microbial and other water-borne contaminants to human health is one factor that contributes to the quality of the recreation experience. Of 12 sites in the Waiau catchment that are regularly monitored for the faecal indicator bacteria *E. coli*, six sites are assessed as having a “very good” grade for human health and one site as being “poor”. The remainder of sites show a “good” or “fair” grade for human health when tested against national objective framework (NPS-FM) *E. coli* criteria. It is likely that key contributors to the poorer grades include faecal contamination in runoff from land carrying livestock in the catchment and from wildfowl, as well as at times from human waste discharges.

Other recreation

Many different types of recreation are valued around water and these values are affected by more than just the human health aspect of water quality. Activities such as swimming, Waka ama, boating, kayaking, rafting, fishing, shellfish gathering, duck shooting, bird watching, walking and trekking, gemstone gathering and mahinga kai all occur in the Waiau catchment at different times of the year. An indicative guide to when recreational activities typically occur is shown in the table below, although some people do some of these activities outside these times.

When do recreational activities occur?

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Whitebait fishing												
Trout fishing					Some rivers							
Salmon fishing												
Duck shooting							Some species					
Swimming/bathing												
Boating/kayaking												

Other factors that influence the quality of the recreation experience include whether there is adequate access, river flow and water clarity for recreation, and whether nuisance and/or toxic periphyton (algae) are present. There is usually adequate flow to support swimming and other recreation in the Waiau River and its lakes, and this is to some extent protected by regional plan rules on water abstraction. Median water clarity is also generally adequate for recreation (i.e., greater than 0.6m visual clarity) but during and after floods, clarity is often poor at many sites due to sediment loss in the catchments and from eroding stream and river banks. Toxic algae (e.g Phormidium) has either been found or identified as at risk of occurring in some parts of the catchment at times and this poses a periodic, temporary risk for dogs and children playing in the water particularly.

The Te Waewae (Waiau) Lagoon is used for walking, bird study, shooting (gamebirds), whitebaiting, bathing, fishing, rowing and possibly Waka ama. Some of these recreation types are described in more detail in following sections. Warnings and risk grades for bathing and shellfish gathering are posted on the Environment Southland website and show periodic risk for contact recreation after heavy rainfall due to the likelihood of pollution from agricultural runoff, stormwater drains and

sewage overflows. Other factors that influence the quality of the recreation experience include water clarity for recreation, and whether nuisance and/or toxic algae are present.

Mahinga kai

Mahinga kai is a pillar of the Ngāi Tahu way of life and is central to Ngāi Tahu ki Murihiku relationships with places, waterways, species and resources, and to the cultural, spiritual, social and economic well-being of Ngāi Tahu. It is also a vehicle for the intergenerational transfer of Mātauranga (knowledge). The practice is complex and encompasses resource harvesting (e.g. food, fibres, muds, clays and soil, stonework), the ability to access the resource, the site where gathering occurs, the act of gathering and using the resource, and the health and wellbeing of the resource. Mahinga kai has many environmental and water-related dependencies that can be categorised into:

- a) environmental dependencies/attributes of the mahinga kai species
- b) environmental dependencies/attributes of the mahinga kai activity
- c) environmental dependencies/attributes of the mahinga kai site(s)

Locations for mahinga kai activity occur throughout the Waiau catchment. Some mahinga kai species of relevance include:

- Tuna (eels)
- Kanakana (lamprey)
- Īnanga (whitebait)
- Waikakahi (freshwater mussels)
- Tuaki (cockles)
- Pipi
- Bubus (pupu) / mud snails
- Patiki (flounder)
- Smelt
- Waterfowl
- Seaweeds
- Toheroa
- Tuatua
- Totara

The lakes in the Waiau catchment are important sources of mahinga kai, having once been bountiful in water-based species such as tuna/eels and other species (kakapo, weka, raupo, totara). The position and character of the Waiau River enabled resources from Fiordland and the interior lakes to be efficiently shipped down to the coast.

Fishing

The majority of lakes and rivers in the Waiau catchment are popular for trout and salmon fishing, with northern rivers known for their fly fishing opportunities. Some popular fishing public access points can be found on fishing websites but there are also other access points through private land and by walking along the river or even from small boats. Threats to fishing values include water abstractions and disturbance of spawning stream habitat, elevated nutrient and sediment effects on water quality, nuisance and toxic algae growth (which can also affect taste of fish), nitrate toxicity (most sites monitored for nitrate toxicity are “very good” with one classed as “good” – none are “fair” or “poor” in the Waiau catchment), bank erosion and loss of riparian vegetation cover.

In addition to the water quality and habitat related threats, fish passage is restricted throughout the catchment, limiting the movement of both native fish and trout and eels. New Zealand has a high

proportion of freshwater fish species that spend part of their life cycle in the ocean. It is important for these species to be able to travel through the river and stream network, and to the coast to complete their life cycles. Man-made structures, such as bridges and culverts can become barriers to fish migration unless well-constructed (e.g. no overhangs, blocked passages, increased water velocity). About 10 fish passage barriers have been identified in the Waiau catchment during a region-wide investigation for that purpose. Fish passage through the Mararoa Weir barrier is managed through structures such as fish ladders and relocation. It is likely that some additional unidentified barriers (e.g. perched culverts, fencing or debris blockages) exist.

Shellfish are gathered in the Te Waewae (Waiau) Lagoon and around its mouth to the sea, with other fish species such as trout, mullet, eels and kahawai also being sought. Customary fisheries (e.g. tuna, kanakana, koura, waikakahi, tuaki/cockles, pipi, tuatua, patiki/flounder and other shellfish) are a major component of mahinga kai as described further in the following section. These fishing values are all compromised by sedimentation and regular macroalgae blooms, and periodically by the likelihood of pollution after heavy rainfall from agricultural runoff, stormwater drains and sewage overflows.

Wai tapu

Water has the spiritual qualities of mauri and wairua. The continued well-being of these qualities is dependent on the physical health of the water. Wai tapu represent the places where Ngāi Tahu ki Murihiku rituals and ceremonies are performed, or where there is special significance to iwi/hapū. Rituals and ceremonies include, but are not limited to, tohi (baptism), karakia (prayer), waerea (protective incantation), whakatapu (placing of rāhui, whakanoa (removal of rāhui), and tuku iho (gifting of knowledge and resources for future generations).

In providing for this value, the wai tapu would be free from human and animal waste, contaminants and excess sediment. Currently all three of these types of contaminants compromise wai tapu values in parts of the Waiau catchment. As already mentioned above under human health and other recreation values monitoring of *E. coli* shows that faecal material from animals and at times humans contaminates waterways in the Waiau catchment. Sediment from soil, river and streambank erosion enters waterways particularly during and after heavy rainfall, while nutrients from agricultural land use leach to groundwater and then enter rivers more or less continuously. Treated human wastewater is discharged from towns to some waterway locations (see commercial and industrial use section below). In addition, some of the springs valued for wai tapu have been disappearing.

Irrigation, cultivation, food production and animal drinking water

Approximately 185,600 ha of land (24% of the total catchment area) is used for farming, with a land use mix of sheep and beef (47% of farming area), dairy and dairy support (10%), deer (9%), mixed livestock and livestock support (33%) and arable and horticulture (less than 0.5%). The majority of land in the Waiau catchment is in conservation (approximately 548,600 ha or 72%) with 6,300 ha (3%) in commercial forestry.

There are approximately seven water takes for irrigation and 28 takes for stock water. Land use consents for dairying specify a maximum consented total of 25,332 dairy cows in the catchment. Both surface and groundwater are taken and used. In comparison to other regions, Southland has a relatively small, narrow-based economy that is largely reliant on its primary sectors and their natural resource use (e.g. agriculture, forestry, fishing, and mining) and related processing, metal

manufacturing and increasingly tourism. Of these sectors, the agriculture share of the economy is particularly significant.

Many farmers have formed catchment groups to help local communities work collaboratively to achieve economically and environmentally sustainable farming. Many shared values have been expressed by people in these groups including: being good stewards of the environment while maintaining economic sustainability, maintaining relationships and communication with all people in the catchment, and maintaining and improving water quality, estuary health and the recreation and fishing values as already described under other headings above.

Other commercial and industrial use

In addition to the commercial use of water for farming, tourism also relies heavily on good environmental qualities to attract visitors. The amenity value of rivers, lakes, wetlands and the estuaries are a key part of the tourism experience for many visitors.

Some small service operations (e.g garages) are found within the catchment area, but the dominant land use is allocated to conservation land, alongside forestry and farming.

Other commercial and industrial areas are located mainly in and near the towns of Tuatapere, Te Anau, Manapōuri and Ohai, where water is used for various commercial uses. The Upukerora River, Home Creek, Orawia Stream and Waiau River receives wastewater and stormwater from the Te Anau, Manapōuri, Ohai and Tuatapere townships respectively, with Te Anau looking to shift to a discharge to land in future. Rivers and streams in the Waiau catchment also receive discharges from commercial activities such as hydroelectric power generation (Pioneer Generation, Meridian Energy), sawmilling and timber processing and gold-mining.

Water supply

There are community water supply schemes in the Waiau catchment. In Te Anau, the Upukerora bore served as the principle water source from 1976 to 1993. Today, three extra bores have been developed adjacent to Lake Te Anau to support the growing township.

The towns in the Waiau catchment that take water for community supply via water supply schemes are:

- Te Anau (groundwater adjacent to Lake Te Anau)
- Manapōuri (surface water from Lake Manapōuri)
- Ohai/Nightcaps/Wairio (surface water)
- Tuatapere (groundwater)

There are also a number of rural water supply schemes in the Waiau catchment, mostly for stock supply:

- Waiau-Eastern Bush rural water supply (surface water)
- Duncraigen Rural water supply scheme (surface water)
- Mount York and Takitimu rural water supply schemes (groundwater adjacent to the Mararoa River)
- Ramparts rural water supply scheme (surface water)

- Homestead rural water supply scheme (surface water)
- Kakapo rural water supply scheme (surface water)

In rural areas there are numerous other small permitted takes of both ground and surface water for potable supply (i.e reasonable domestic and stock drinking supply).

Most bores and wells in these catchments have groundwater quality that is safe for drinking by humans without treatment, although 5% (2 of 40 bores) sampled show unsafe nitrate levels and 26% (9 of 35 bores) regularly have unsafe bacteria levels. While most groundwater is safe to drink, many bores (23%) have moderate to high concentrations of nitrate, contributing to nitrate levels in the streams and estuary.

Natural form and character

Many areas within the Waiau catchment are valued for their natural form, character and scenic features. The lake networks to the north of the catchment, combined with areas of protected forest and tussock, make the catchment a popular tourist destination. Changes to river and lake structures through hydroelectric power schemes have changed natural forms, especially to Lake Manapōuri, Lake Monowai, and the Waiau River. Other changes are evident in riparian and margin land vegetation clearance, hydrological regime changes (abstraction and drainage), channel works, invasive weeds and human structures (bridges, bank protection works, and culverts). Yet in light of this, the broader Waiau catchment is considered to be of significant value, protected through a variety of conservation systems as mentioned above.

Transport and Tauranga waka

The mainstem Waiau River is navigable by waka, kayak and canoe with recreation and commercial boating activities occurring at Tuatapere and on Lakes Manapōuri and Te Anau. Water quality is an important aspect of enjoying boating activities and poor water quality degrades the experience.

Other values

As we work with tangata whenua and the community, other values may be included in how we manage the Waiau catchment. For example other values Ngāi Tahu ki Murihiku has for water and land include:

- Tino Rangatiratanga
- Whakapapa
- Kaitiakitanga
- Ki uta ki tai
- Mauri
- Wairua
- Manaakitanga
- Mātauranga Māori
- Te Reo
- Whānaungatanga
- Utu

For more information, see 'Our uses: Cultural uses in Murihiku' by Gail Tipa, 2011.

Maori term	English Translation
Āu Putea	Economic or commercial value
Pūpū (Bubu's)	Common Cats-eye, univalve mollusc
Hananui	Mount Anglem
Hapū	Kinship group, sub tribe
Hautere	Solander Island
He ara haere	Navigation
Inanga	Whitebait
Iwi	Tribe, nation, people
Kahawai	Coastal fish
Kai	Food, sustenance
Kaika	Permanent settlement/village
Kaitiakitanga	Guardianship
Kanakana	Lamprey
Karakia	Prayer
Ki uta ki tai	From mountains to the sea
Koaro	Species of Whitebait
Kōau	Black Shag
Kōkopu	Native fish species
Koura	Fresh water crayfish
Mahi māra	Cultivation
Mahinga kai	Food, and places for obtaining natural foods, methods and cultural activities involved
Mako	Species of shark
Mana	Integrity, respect, prestige, authority
Mana whenua	Traditional/customary authority or title over land, and the rights of ownership and control of usage on the land, forests, rivers etc. Manawhenua is held by an iwi or hapū rather than individuals. Also the land area (and boundaries, Rohē) within which such authority is held
Manaaki	Support, take care of and give hospitality, towards guests/people
Manaakitanga	Support, caring and hospitality, as shown towards guests

Manawa Popore	Early name of Lake Manapōuri
Māngai Piri	Niagara Falls
Manuhiri	Visitor, quest
Marae	Traditional Māori open meeting ground.
Mātaitai	Customary fishing reserve
Mātauranga	Knowledge
Mauri	Spiritual essence, life-force
Māngai Piri	Niagara Falls
Motupōhue	Bluff
Nohoanga	Temporary campsite (stopover), for seasonal gathering of food/kai and natural resources
Ōuruwera	Lake George
Papatipu Rūnanga	Similar to regional councils
Pārera	Grey duck
Pātea	Doubtful Sound
Pātiki	Flounder
Pipi	Edible Bi-valve mollusc
Piopiotahi	Milford Sound
Pounamu	Greenstone
Pūtangitangi	Paradise shell duck
Rāhui	Restriction, reservation/exclusion under tribal authority,
Rakiura	Stewart Island
Rangātira	Chief
Raratoka	Centre Island
Raupo	Bulrush plant
Rūnanga	Council, Iwi Authority
Ta ara tawhito	Traditional routes
Takahahaka	Eyre Mountains
Taonga	Treasured possession, material or abstract (e.g. language)
Tangata	Person, individual

Tapu	Sacredness, forbidden, restricted
Tauranga waka	Anchorage, mooring
Te ara tawhito	Traditional routes
Te Au-nui	Mataura Falls
Te Hauora o te Taiao	The health and mauri of the environment
Te Hauora o te Tāngata	The health and mauri of the people
Te Hauora o te Wai	Health and mauri of the water
Te Mana o te Wai	Integrated and holistic wellbeing of water bodies
Te Reo Māori	Māori language
Te Waipounamu	South Island
Tikanga	Rights, customs, accepted protocol, rule, Māori traditions, lore or law, the correct Māori way
Ti kouka	Cabbage tree
Tino Rangatiratanga	Self-determination, sovereignty, autonomy
Titi	Mutton-bird
Toheroa	Large edible bi-valve mollusc
Tohi	Baptism
Toki	Adze, axe, hatchet
Tōpuni	Derives from the traditional Ngāi Tahu custom of persons of rangatira (chiefly) status extending their mana and protection over an area or person by placing their cloak over them or it
Tuaki	Cockles
Tuatua	Edible bi-valve mollusc
Tuku iho	Gifting of knowledge and resources for future generations
Tuna	Eels
Tūpuna	Ancestors
Utu (n)	Revenge, retaliation, payback, retribution, cost, price, wage, fee
Waerea	Protective incantation
Wāhi tapu	Sacred place/s
Wai Kākahi	Freshwater mussels

Wai Koura	Freshwater crayfish
Wai Māori	Freshwater
Wairua	Spirit
Wai tapu	Sacred waters
Waipārera	Traditional Māori name for the Waituna Lagoon
Waka	Canoe, Conveyance
Waka ama	Outrigger canoe
Whānui (a)	Be broad, wide, extensive
Whakanoa	Removal of Rāhui
Whakatapu	To place a tapu, reserve, restrict, ban
Whakapapa	Genealogy, Lineage, Kinship
Whānaungatanga	The relationship which binds people together through common genealogy; unity of purpose and mutual support
Whenua	Land, Country
Whenua Hou	Codfish Island