

Waimatuku Catchment Group

Fresh water health and landscape influences
in Waimatuku Catchment



**THRIVING
SOUTHLAND**

*Tōmū ana te whenua. Tōmū ana te takata.
A thriving, prosperous land. A thriving, prosperous people.*

AS AT NOVEMBER 2021
Further updates will be included as new
information becomes available.

Welcome to Waimatuku Catchment brochure

This Waimatuku Catchment Group brochure is one of a series of brochures on catchments in Southland.

Catchment Groups have been asking for more detailed insights into their individual catchments. This brochure provides insights based on available information, bringing together published science, research, data and information on the state of water, soil and land in Waimatuku Catchment.

It provides details on what affects water quality and how these impact the rest of the catchment, including out of catchment areas that may be impacted by what goes on in the catchment, such as the estuary.

Although this brochure collates all the available information that has been brought together in a literature review commissioned by Thriving Southland - the Science Report thrivingsouthland.co.nz/science-report - it may not have all the details you know about in your catchment, or the research you may have done on your farm or in your Catchment Group.

How to use this brochure

This brochure sets out (publicly available) details on:

- » Water quality
- » Landscape influences
- » Physiographic zones
- » Groundwater management zones (GMZs)
- » Measuring what lives in streams and rivers
- » Macroinvertebrate community index (MCI)
- » Estuary health
- » Where to get more information.

If you are not familiar with the terms and language used, read the brochure in conjunction with this glossary environment.govt.nz/publications/environmentaotearoa-2019-glossary.

We also recommend you check out the Catchment Group page on thrivingsouthland.co.nz/waimatuku to learn more about the catchment and what projects the Catchment Group has underway or planned.

Interpreting what the data in the brochure means

Because this brochure brings together the data available, we have deliberately not interpreted that data or explained what the trends may mean for your catchment.

We recommend you contact an environmental consultant, your Thriving Southland Catchment Group coordinator or Environment Southland to speak to experts who can explain what these trends and data may mean for your catchment, or for your farm specifically.

You can also check out a range of information on the Thriving Southland Information Resource Hub thrivingsouthland.co.nz/infohub which will connect you with tools and resources from many different organisations to help with understanding limit setting, environmental contributing factors, mitigations and options available to you.

A little bit about Thriving Southland

Thriving Southland supports Southland's Catchment Groups to understand challenges and opportunities in their catchments and create innovative and exciting solutions.

We have a vision to create a prosperous Southland, healthy people, and a healthy environment, and believe that by working together, Thriving Southland's communities will create a better future for all by protecting the region's prosperity, heritage, environment and health.

Thanks

Thank you to the farmers who supported the development of this brochure, and to the Ministry of Primary Industry for its Sustainable Land Use Programme which supports the work Thriving Southland is delivering for farmers and communities in Southland. Thank you also to Environment Southland who reviewed the content of this brochure.



Water quality in Aparima Catchment

Aparima Catchment

Waimatuku is a sub unit of the Aparima Freshwater Management Unit (FMU). The Waimatuku Catchment outflows into the Waimatuku Estuary. The Waimatuku Estuary is a 2km long, shallow tidal estuary (20 ha) that periodically closes to the sea.

The estuary is currently considered to be in fair condition. A wide range of waterfowl and birds, shags and waders are regularly present.

Summary of Waimatuku Catchment

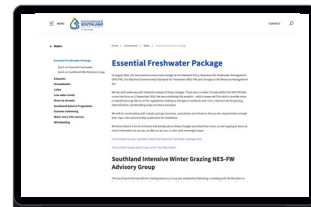
The hydrology, health and functions of a stream/river or area of groundwater are directly linked to the characteristics of its catchment, including the landscape, soils and human activities.

- » Large areas of this zone fall into the Central Plains physiographic zone. Other areas consist of a mosaic of oxidizing, peat wetlands and gleyed physiographic zones. Smaller areas of the lignite-marine terraces physiographic zone also occur.
- » Most of this catchment areas overlies the Waimatuku GMZ. However, the western edge overlies part of the Lower Aparima GMZ.
- » Water quality in this catchment is variable. Surface water is showing degradation in terms of *E. coli*, nitrogen and phosphorus. Nitrate and *E. coli* are high in groundwater.
- » Neighbouring farms on different zones may have very different water quality outcomes with similar farm practices due to different contamination movement and attenuation pathways (reducing the effects of contaminants).



What does this mean?

- » In August 2020, the Government announced changes to the National Policy Statement for Freshwater Management (NPS-FM), the National Environmental Standard for Freshwater (NES) and changes to the Resource Management Act. These outline changes in regulations relating to wetlands and rivers, intensive winter grazing, intensification, stockholding areas and stock exclusion.
- » More about Environment Southland's response to the Government's Essential Freshwater Package is here es.govt.nz/environment/water/essential-freshwater-package



- Environment Southland, in partnership with Te Ao Mārama Inc*, has indicated a proposed limits and targets plan change (LTPC) will be notified in 2023. This will establish nutrient limits and targets to improve the quality of groundwater and surface water. waterandland.es.govt.nz/about/values-and-objectives
- » Environment Southland and Te Ao Mārama Inc have established a community-based regional forum to consider and advise on limits, targets, and methods.
 - » Plan changes will result in additional controls and rules in Southland that will be focused on reducing the loss of nutrients, specifically nitrogen and phosphorus, and reducing discharges of sediment and faecal microorganisms, from land to groundwater and surface water.
 - » In the Environment Southland Proposed Water and Land Plan there is a focus on good management practices (GMPs) and farm environmental management plans (FEPs). You can view GMP factsheets for each physiographic zone on the Environment Southland website es.govt.nz

* Te Ao Mārama Incorporated looks after mana whenua interests in resource management and other aspects related to local government in Southland. It is authorised to represent three Ngāi Tahu papatipu runanga in Murihiku/Southland. It is involved in the protection of the spiritual and cultural values of the region, including wahi tapu (sacred places), mahinga kai (gathering of food and resources) and other natural resources.

Waimatuku water quality

Surface water quality is assessed by testing how much nitrogen, phosphorus and *E. coli* is present. LAWA summary results for this catchment are (lawa.org.nz):

Total oxidised nitrogen

Monitoring site	5-year median	5-year trend	10-year trend	15-year trend
Waimatuku Stream at Lorneville Riverton	3.7 mg/L			

^ Total Oxidized Nitrogen (TON) is the sum of nitrate and nitrite. Nitrite is generally a very small fraction of the TON concentration in rivers, TON is taken to be equivalent to the nitrate concentration

* 2014-2018 LAWA median per NPS-FM 2020 using TON as surrogate for N03-N

* Too much TON can contribute to excessive algal growth in waterways

Ammoniacal nitrogen

Monitoring site	5-year median	State	5-year trend	10-year trend	15-year trend
Waimatuku Stream at Lorneville Riverton	0.005 mg/L				

* If ammoniacal nitrogen reaches very high concentrations it can become toxic under certain temperature and pH conditions

Dissolved reactive phosphorus

Monitoring site	5-year median	State	5-year trend	10-year trend	15-year trend
Waimatuku Stream at Lorneville Riverton	0.044 mg/L				

* Dissolved reactive phosphorus concentrations are an indication of a waterbody's ability to support nuisance algal or plant growths (algal blooms)

Total phosphorus

Monitoring site	5-year median	5-year trend	10-year trend	15-year trend
Waimatuku Stream at Lorneville Riverton	0.072 mg/L			

* Too much phosphorus can encourage the growth of nuisance plants such as algal blooms

KEY (STATE)

Very good	Good
Fair	Poor

KEY (TREND)

Very likely improving	Likely improving	Indeterminate
Very Likely degrading	Likely Degrading	Not Assessed

E. coli

Monitoring site	5-year median	State	5-year trend	10-year trend	15-year trend
Waimatuku Stream at Lorneville Riverton	380n/100ml	E			

* 2016-2020 LAWA median graded as per NPS-FM 2020

* High concentrations of this bacteria exceeding water quality guidelines indicate faecal contamination which can be harmful to humans.

KEY (STATE)			KEY (TREND)		
A Very good (infection risk is 1%)	B Good (infection risk is 2%)	C Fair (infection risk is 3%)	 Very likely improving	 Likely improving	 Indeterminate
D Poor (infection risk is >3%)	E Very Poor (infection risk is >7%)		 Very Likely degrading	 Likely Degrading	 Not Assessed

Results from lawa.org.nz (October 2021)

MCI

Macroinvertebrates include the caddisflies, mayflies, stoneflies, worms and snails that live in rivers. They are an important food source for fish and birds and sensitive to the combination of nutrients, sediment and habitat. Due to this sensitivity, they are considered to be a good representation of overall water quality and ecosystem health. The different macroinvertebrates present can be identified and then converted to a score called the MCI.

A higher MCI score generally indicates a healthier stream. Generally, MCI scores range from >150 (very good water quality) to as low as 20 (very poor water quality).

Results for this catchment are (from LAWA October 2021):

MCI

Monitoring site	5-year median	State	10-year trend	15-year trend
Waimatuku Stream at Lorneville Riverton	91.0	C		

KEY (STATE)		KEY (TREND)		
A Macroinvertebrate community indicative of pristine conditions with almost no organic pollution or nutrient enrichment.	B Macroinvertebrate community indicative of mild organic pollution or nutrient enrichment. Largely composed of taxa sensitive to organic pollution/nutrient enrichment.	 Very likely improving	 Likely improving	 Indeterminate
C Macroinvertebrate community indicative of moderate organic pollution or nutrient enrichment. There is a mix of taxa sensitive and insensitive to organic pollution/nutrient enrichment. National bottom line: MCI score 90	D Macroinvertebrate community indicative of severe organic pollution or nutrient enrichment. Communities are largely composed of taxa insensitive to inorganic pollution/nutrient enrichment.	 Very Likely degrading	 Likely Degrading	 Not Assessed

Estuary health

Table 2: Estuary risk indicators (ES 2019/2020)

As Waimatuku Estuary is located in the Waimatuku Catchment, it is an important factor in understanding the impacts of water quality in Waimatuku.

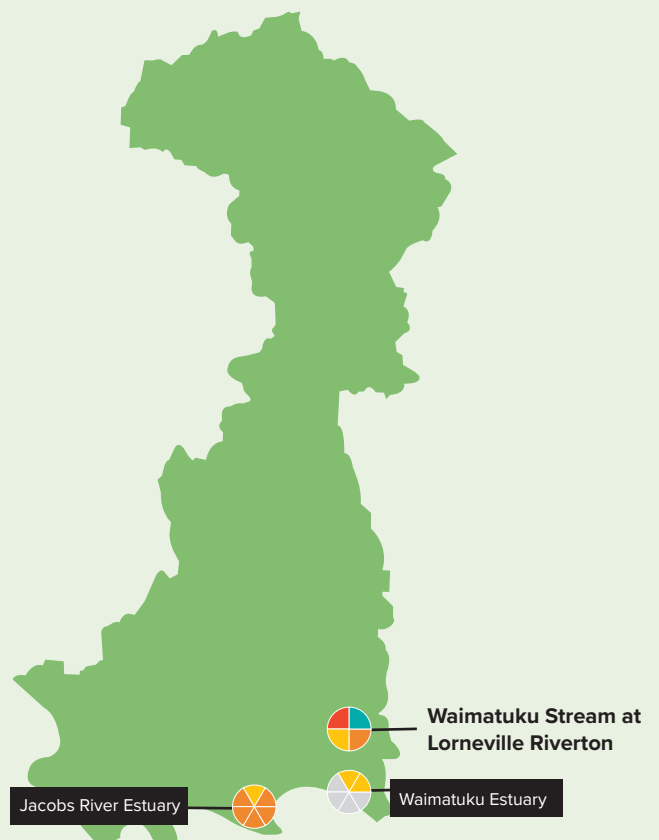
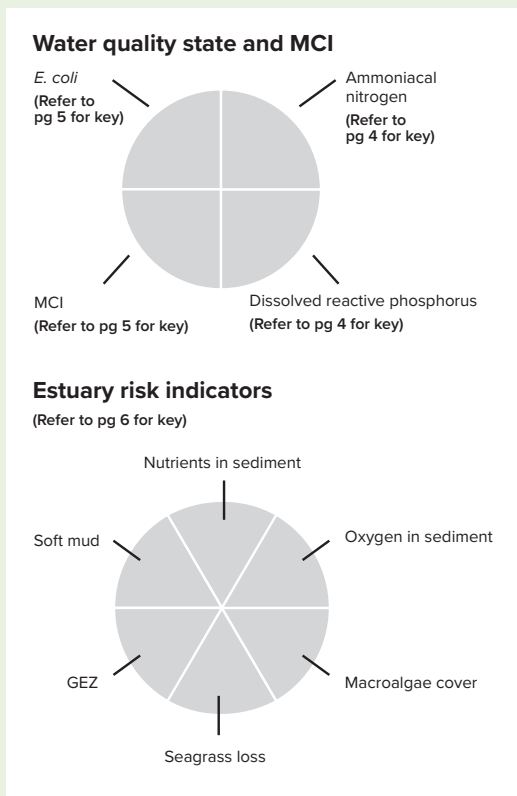
Estuary water quality data gives a good indication of what is happening upstream across all the catchments that feed into the waterways supplying the estuary and therefore impact on the ecosystems and the cultural values of the area.

Estuary	Soft mud	Nutrients in sediment	Oxygen in sediment	Macroalgae cover	Seagrass loss	GEZ*
Waiau Lagoon/Te Wae		Orange	Yellow			
Lake Brunton			Green			
Waituna Lagoon/Waiparera (not assessed)						
New River Estuary	Orange	Orange	Orange	Yellow	Orange	Orange
Jacobs River Estuary	Orange	Yellow	Orange	Orange	Orange	Orange
Waikawa Estuary	Orange	Yellow	Orange	Green	Orange	Green
Haldane Estuary	Yellow	Green	Teal	Teal		Teal
Freshwater Estuary	Teal	Green	Teal	Green	Yellow	Teal
Waimatuku Estuary		Yellow	Yellow			
Toetoes Estuary	Yellow	Green	Orange	Yellow	Orange	Green

KEY Very Good Good Fair Poor

* Gross Eutrophic Zone (GEZ) is defined as an area that has low sediment oxygenation (<1cm aRPD), soft mud (>25% mud content) and the presence of high macroalgal cover (>50% cover). These areas are in poor condition and can no longer support most estuarine animals and shellfish.

Aparima Catchment with Estuaries and Surface water quality monitoring sites*



*Sites in Waimatuku Catchment only shown

Landscape influences

What we do on the land can affect our water, but how it affects our water depends on a range of factors, including how our landscape works. It is useful to look at:

- » Physiographic zones which help to explain how nitrogen, phosphorus, sediment and faecal microorganisms (such as *E. coli*) move and are attenuated (reduced, e.g. by biological or chemical processes).
- » GMZs which highlight the connectivity between land, surface water and groundwater.

Physiographic zones

Southland has been divided into nine physiographic zones to help understand how water moves across the landscape and why water quality is better in some places than others. Each physiographic zone represents an area that has similar factors influencing water quality, such as climate, topography, geology and soil type.

Large areas of this catchment fall into the Central Plains physiographic zone. Other areas consist of a mosaic of oxidizing, peat wetlands and gleyed physiographic zones. Smaller areas of the lignite/marine terraces physiographic zone also occur (see map below). These zones differ in the way contaminants are transported and attenuated within the catchment.



Waimatuku Catchment showing physiographic zones

Peat wetlands

This zone features poorly drained peaty soils that are extremely acidic. The water table in these areas is high. Developed areas require extensive artificial drainage. Soluble phosphorus concentrations are high in acidic oxygen depleted ground and surface waters; conversely nitrate concentrations are low.

Lignite-marine terraces - artificial drainage

Located on gently undulating land that has slow subsoil permeability and may be seasonally wet.

Denitrification* rates are high, meaning that much of the nitrate leached to groundwater in this zone is converted to nitrogen gas via various reactions involving bacteria.

Central plains

This zone is characterised by clay-rich soils that shrink and crack when dry. This allows water (carrying nitrogen, phosphorus and faecal micro-organisms) to drain quickly to underlying aquifers.

These soils are also prone to waterlogging when wet and require extensive artificial drainage to maintain productivity. Nitrogen, phosphorus, sediment and faecal micro-organisms can all be rapidly carried to surface waterways via mole-pipe drains.

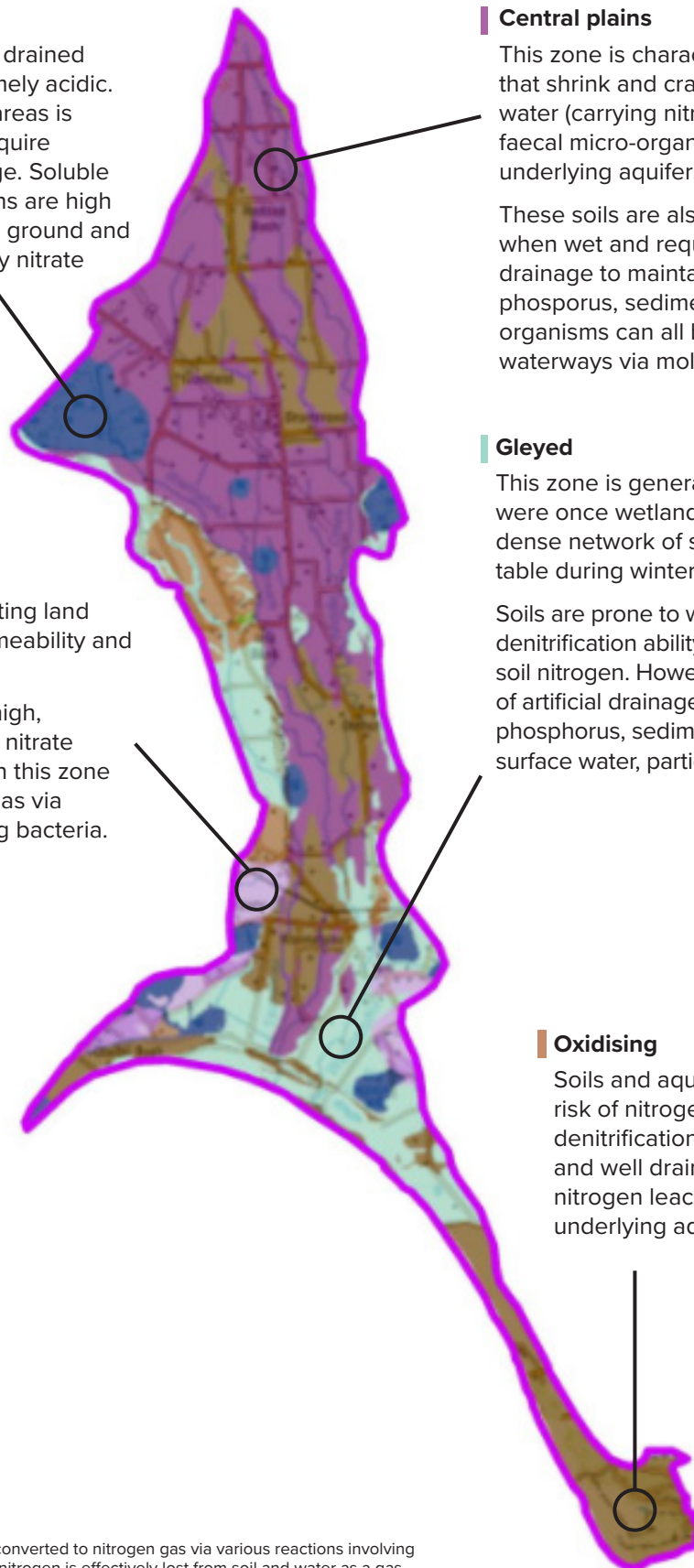
Gleyed

This zone is generally found in areas that were once wetlands. It is characterised by a dense network of streams and a high water table during winter.

Soils are prone to waterlogging and have some denitrification ability, which reduces build-up of soil nitrogen. However, an extensive network of artificial drainage rapidly transports nitrogen, phosphorus, sediment and faecal microbes to surface water, particularly during heavy rain.

Oxidising

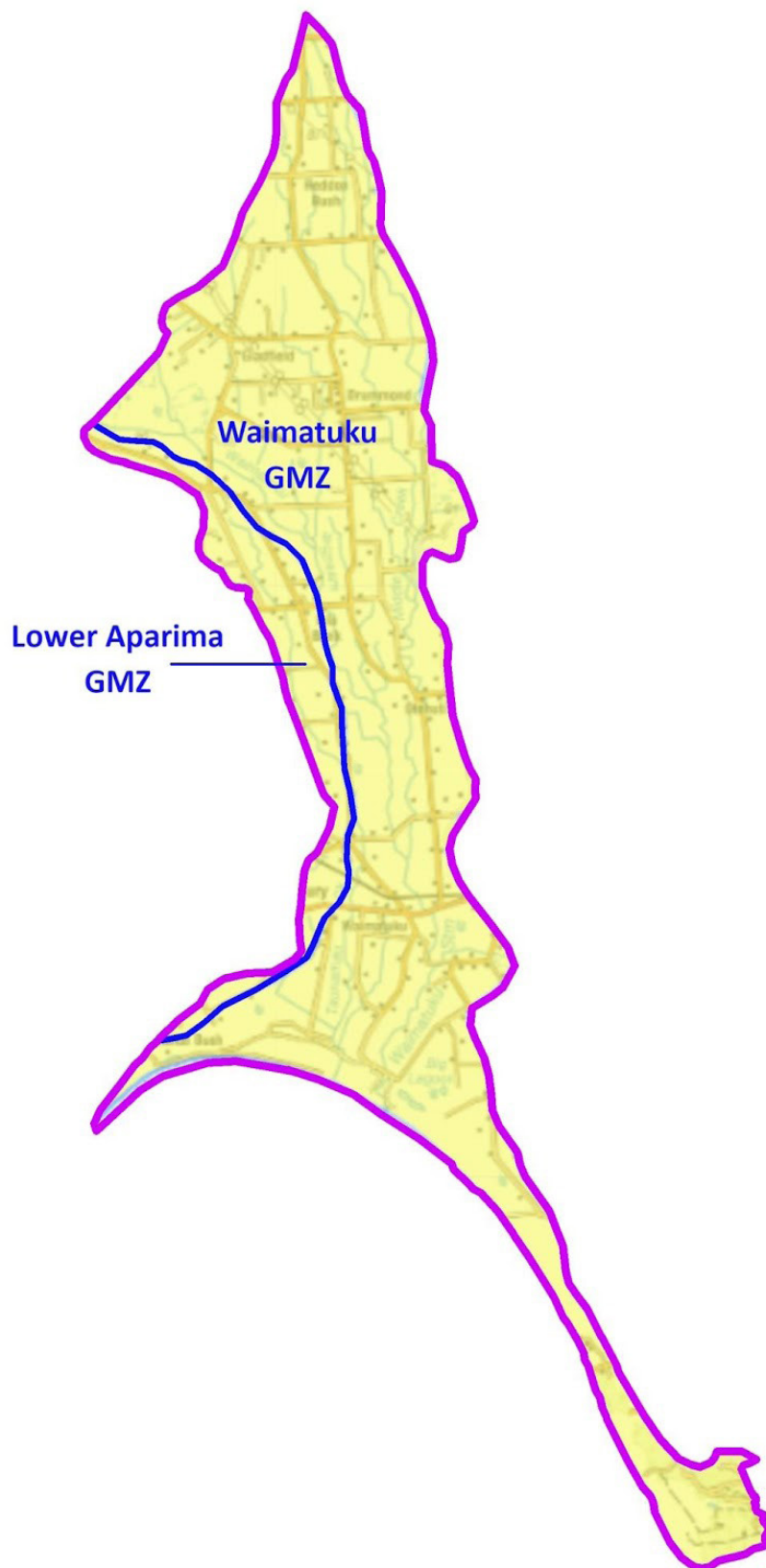
Soils and aquifers in this zone have high risk of nitrogen build-up due to low rates of denitrification*. The combination of flat land and well drained soils results in high rates of nitrogen leaching (deep drainage) to underlying aquifers.



*Denitrification occurs when nitrate is converted to nitrogen gas via various reactions involving bacteria. Where denitrification occurs, nitrogen is effectively lost from soil and water as a gas. This is a form of attenuation.

GMZ - Waimatuku

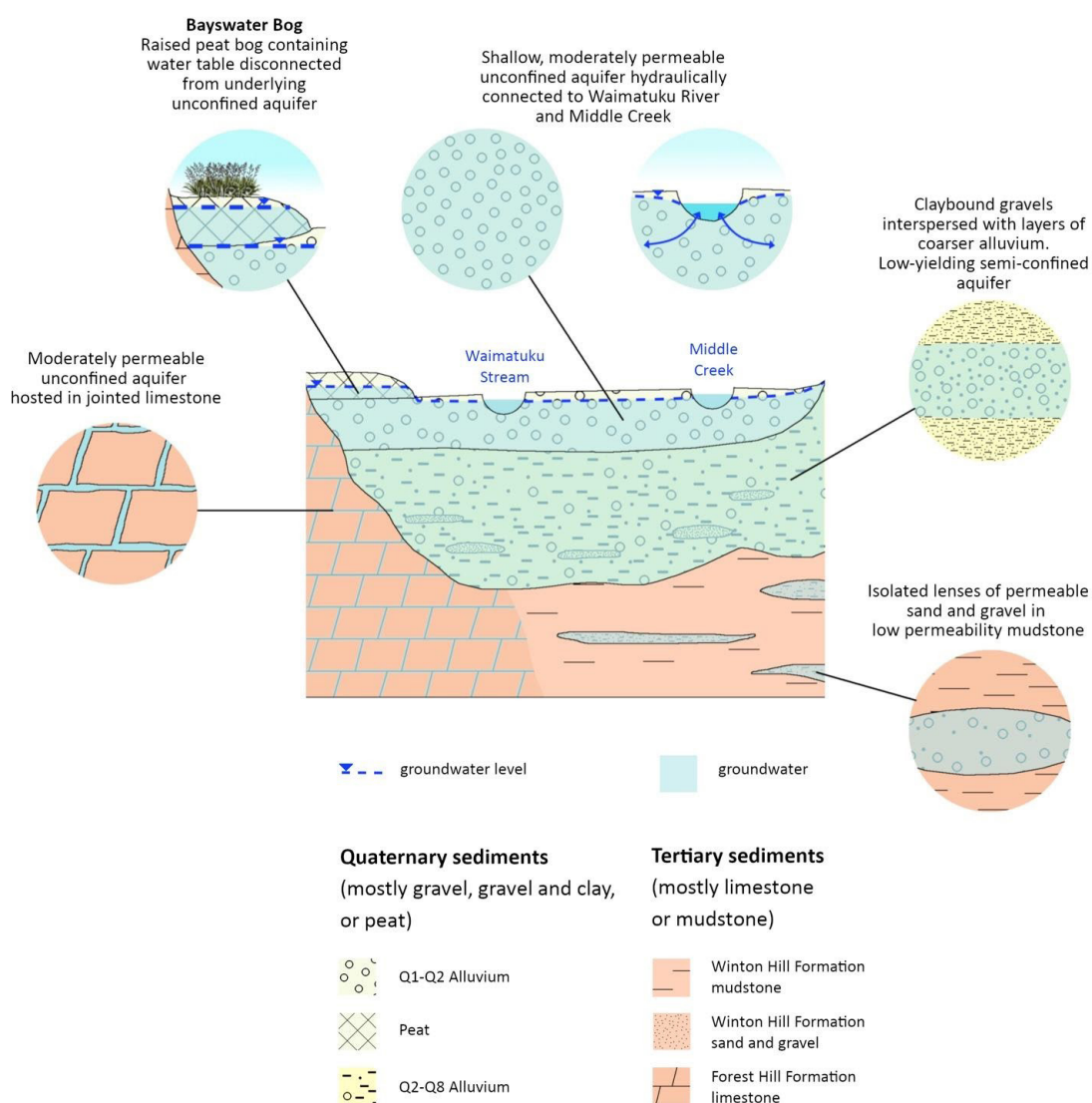
The majority of the Waimatuku Catchment area overlies the Waimatuku GMZ. The western edge of the catchment overlies part of the Lower Aparima GMZ.



Waimatuku GMZ

The Waimatuku GMZ covers an area of approximately 23,700 ha. It encompasses Waimatuku Stream Catchment, which drains to the south coast near Riverton.

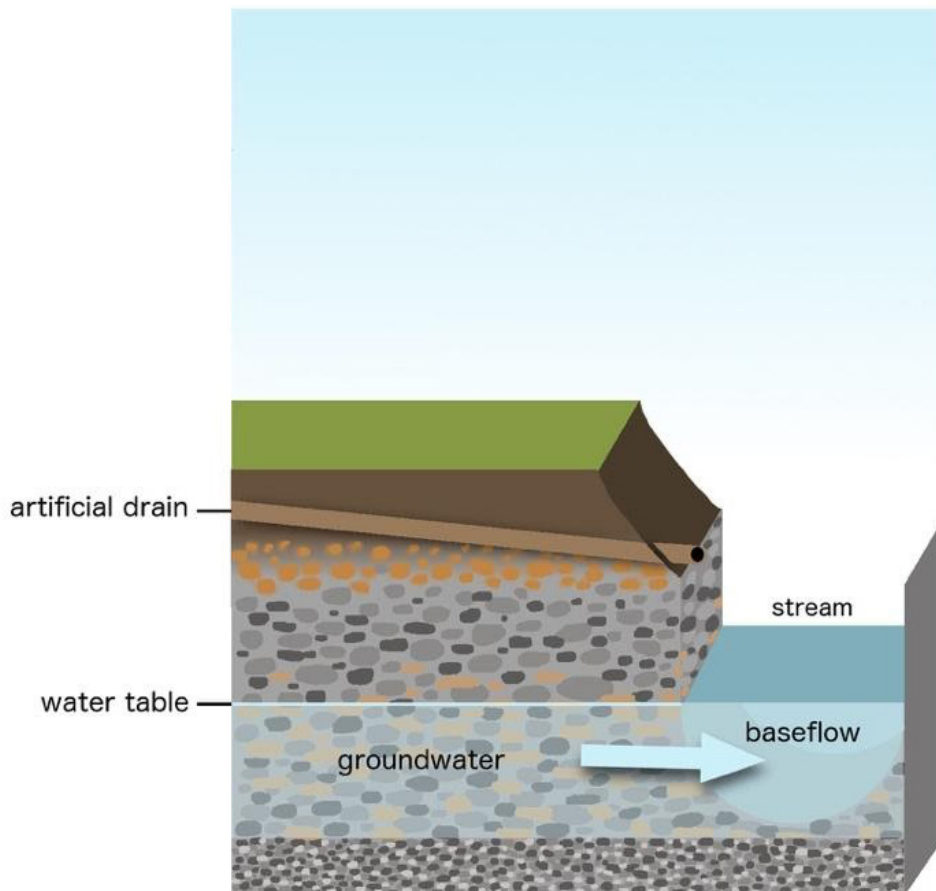
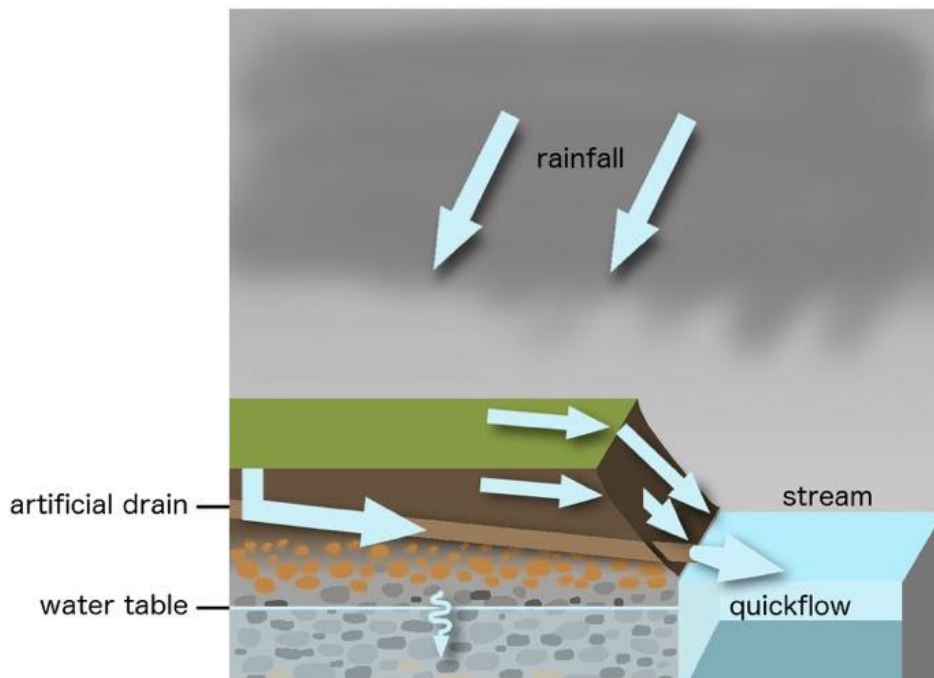
- » Depth to groundwater ranges from two to four metres below ground level.
- » Seasonal variation in groundwater levels is generally less than one metre.
- » A diagrammatic cross-section of this GMZ showing areas of groundwater is here es.govt.nz/environment/water/groundwater/groundwater-management-zones/waimatuku
- » The thick gravel layer in this area hosts an aquifer system that is highly connected to surface streams.
- » Groundwater recharge in this zone is derived from local rainfall that soaks through the soil. Therefore, there is a high risk of groundwater contamination from leaching.



Groundwater quality Waimatuku GMZ

- » Nitrate = moderate to high
- » Phosphorus = low
- » *E. coli* = elevated where there is artificial drainage.

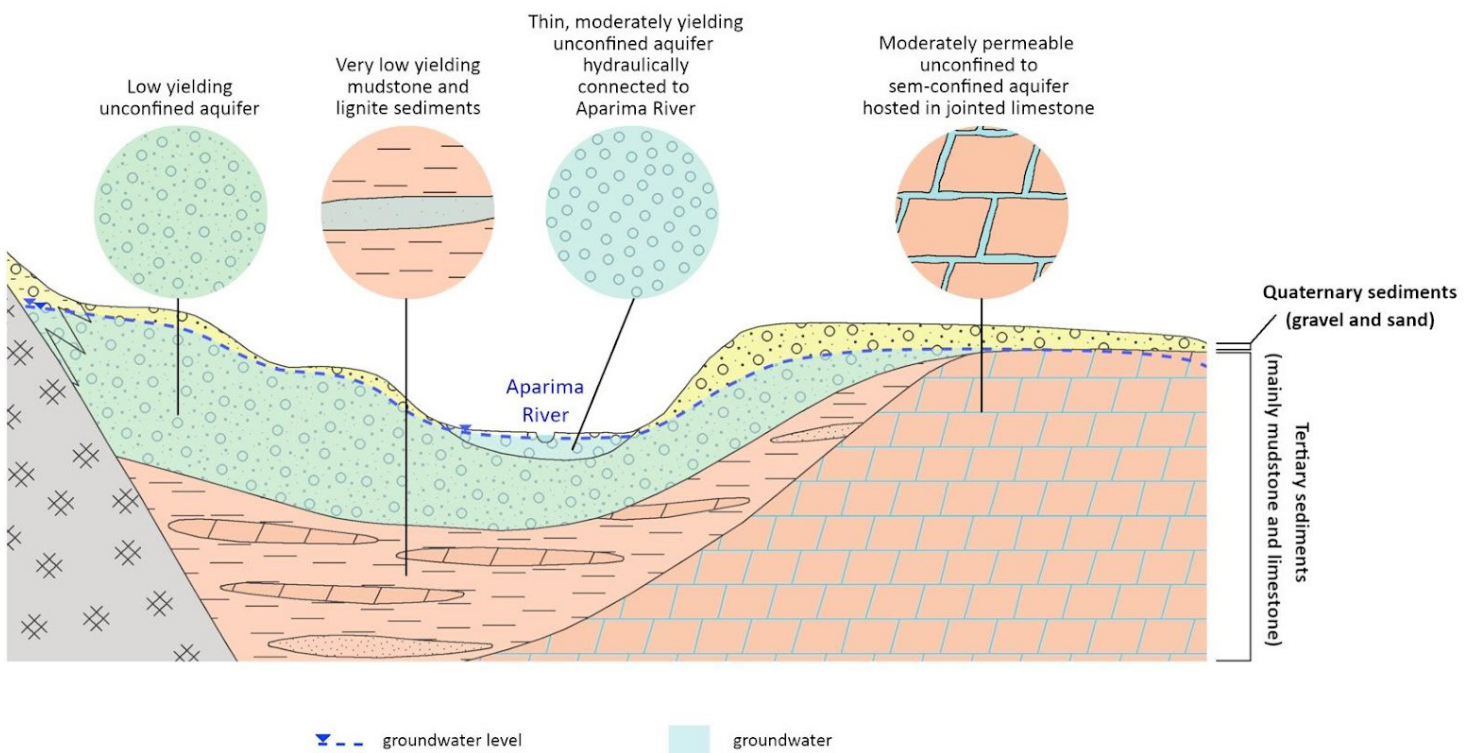
Groundwater provides baseflow to surface streams and rivers, and artificial drainage networks in lower lying areas. If nitrate is high in groundwater, it can flow into connected streams increasing stream nitrate levels. The reverse can also occur. The connection between groundwater and the baseflow of streams and rivers is illustrated below (source: Environment Southland).



Lower Aparima GMZ

The Lower Aparima GMZ covers approximately 29,000 ha in the lower reaches of Aparima River Catchment.

- » Depth to groundwater ranges from less than two metres below ground level on Aparima River floodplain to 20 metres below ground level in limestone aquifers underlying higher terraces.
- » Seasonal groundwater variation is generally less than two metres, but can be up to 10 metres in limestone aquifers.
- » A diagrammatic cross-section of this GMZ showing areas of groundwater is provided below (source es.govt.nz/environment/water/groundwater/groundwater-management-zones/lower-aparima).
- » Groundwater recharge in this zone is derived from local rainfall and runoff from surrounding hills that soaks through the soil. Groundwater discharge mostly occurs as springs and as baseflow to Aparima River.



Quaternary sediments

- Q1 Alluvium
- Q2 Alluvium
- Alluvial Fan
- Q6-8 Alluvium

Tertiary sediments

- Winton Hill Formation mudstone
- Winton Hill Formation sandstone
- Winton Hill Formation lignite
- Forest Hill Formation limestone

Basement rock

- Brook Street Terrane (volcaniclastic sediments)

Groundwater quality Waimatuku GMZ

- » Nitrate = generally low but may be elevated in shallow limestone aquifers
- » Phosphorus = low
- » *E. coli* = low, but risk may be elevated close to source.



Find out more

Environment Southland Aparima flood warning fact sheet

bit.ly/3cLate5

Find out more about physiographic zones

bit.ly/2OI7z7F

Find out more about Southland's groundwater

bit.ly/30Db5g1

Find out more about stream health

Environment Southland

es.govt.nz/environment/water/rivers-and-streams

Land Air Water Aotearoa (LAWA)

lawa.org.nz

Ministry for the Environment

environment.govt.nz/facts-and-science/freshwater

Link to iwi freshwater objectives

bit.ly/2P4HsBV

Get in contact

For more information about your catchment and to contact your local catchment coordinator

021 466 700 | office@thrivingsouthland.co.nz

thrivingsouthland.co.nz/catchment-groups



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