

Wendonside Catchment Group

Fresh water health and landscape influences
in Wendonside Catchment



**THRIVING
SOUTHLAND**

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

AS AT OCTOBER 2022
Further updates will be included as new
information becomes available.

Welcome to Wendonside Catchment brochure

This Wendonside 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 the Wendonside 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 – called 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/environment-aotearoa-2019-glossary.

We also recommend you check out the catchment group page on thrivingsouthland.co.nz/wendonside/ 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/info-hub which will connect you with tools and resources from many different organisations to help you 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 and quantity in the Maitaura Catchment

Maitaura Catchment

Wendonside is part of the Maitaura Catchment which outflows via the Maitaura River into the Toetoes (Fortrose) Estuary. The Maitaura River and Toetoes Estuary are an important source of mahinga kai, particularly kanakana (lamprey), inanga (whitebait) and tuna (eels).

Land use and various industrial and municipal water discharges are key contributors to the degradation of water quality in the Maitaura catchment. Currently the Toetoes Estuary is considered to be in poor condition.

The Maitaura Water Conservation Order was made in 1997. This stipulates that at any point above the Maitaura Island Road Bridge, 95 percent of the natural flow in the Maitaura River must remain, meaning only five percent of the flow in the Maitaura River is available for allocation and use - e.g., irrigation, dairy supply - at any one time. The Maitaura River above Gore has been over allocated (more water is allocated to abstractors than is allowed by the Water Conservation Order). Environment Southland is working with consent holders to resolve this.

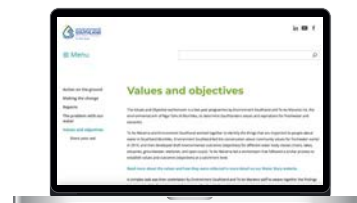
Summary of Wendonside Catchment

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

- » This catchment covers a mosaic of six different physiographic zones that differ in nitrate and phosphorus levels from land use
- » It overlies the
 - » Wendonside GMZ, which has very high nitrate levels in some areas
 - » Wendon GMZ, which has low to moderate nitrate levels
- » Wendonside Catchment area also overlies part of the Cattle Flat GMZ in the north-west and part of the Waipounamu GMZ in the south-west, both of which have low to moderate nitrate levels
- » Water quality in this catchment is generally good but is showing stress in terms of *E. coli* (faecal bacteria) (surface water), and nitrate in some areas (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
- » Environment Southland, in partnership with Te Ao Marama Incorporated (as the environmental arm of Ngāi Tahu Ki Murihiku), is working towards updating the Water and Land Plan in line with the 2020 NPS-FM. This update is known as Plan Change Tuatahi (first plan change), and will set limits, targets and methods (for discharges to and abstractions from waterways) that will help achieve hauora, a state of healthy resilience, for waterbodies. There will be an opportunity for public submissions to this plan in 2023 before it is finalised in 2025 waterandland.es.govt.nz/about/values-and-objective



- » 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.

Wendonside 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 shown below (lawa.org.nz):

Total oxidised nitrogen









Monitoring site	5-year median	5-year trend	10-year trend	15-year trend
Waikaia River at Waikaia	0.134 mg/L			
Waikaia River at Waipounamu Bridge Road	0.59 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

* 2016-2020 LAWA median per NPS-FM 2020 using TON as surrogate for NO₃-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
Waikaia River at Waikaia	0.005 mg/L				
Waikaia River at Waipounamu Bridge Road	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
Waikaia River at Waikaia	0.005 mg/L				
Waikaia River at Waipounamu Bridge Road	0.006 mg/L				

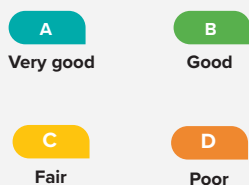
Dissolved reactive phosphorus concentrations are an indication of a waterbody's ability to support nuisance algal or plant growths (algal blooms).

Total phosphorus

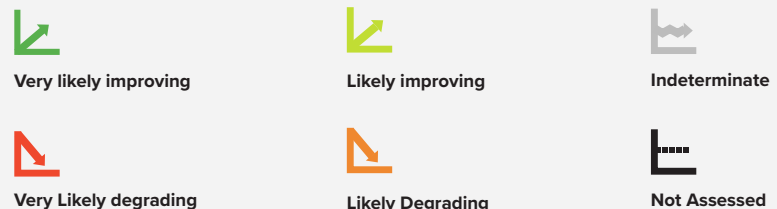
Monitoring site	5-year median	5-year trend	10-year trend	15-year trend
Waikaia River at Waikaia	0.012 mg/L			
Waikaia River at Waipounamu Bridge Road	0.016 mg/L			

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

KEY (STATE)



KEY (TREND)



E. coli

Monitoring site	5-year median	State	5-year trend	10-year trend	15-year trend
Waikaia River at Waikaia	130 n/100 mL	D			
Waikaia River at Waipounamu Bridge Road	130 n/100 mL	D			

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

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 (September 2022)

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).

The MCI scores for the Wendonside Catchment are (LAWA September 2022):

MCI

Monitoring site	5-year median	State	10-year trend	15-year trend
Waikaia River at Waikaia	113.0	B		
Waikaia River at Waipounamu Bridge Road	115.3	B		

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.	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

National bottom line: MCI score 90

Estuary Health

Table: Estuary state information (provided by Environment Southland July 2021 es.govt.nz state and outcome map).

The estuary is at the bottom of the Maitara Catchment and receives water from the Upper Maitara, Gore and Lower Maitara Catchments. Decisions made in the Catchment that affect water quality, flow downstream and impact on water quality in the estuary.

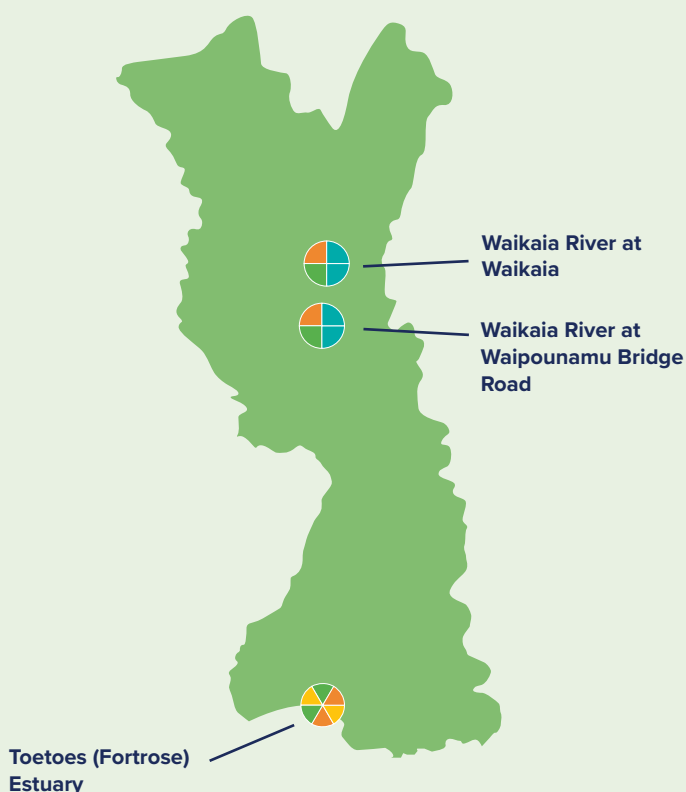
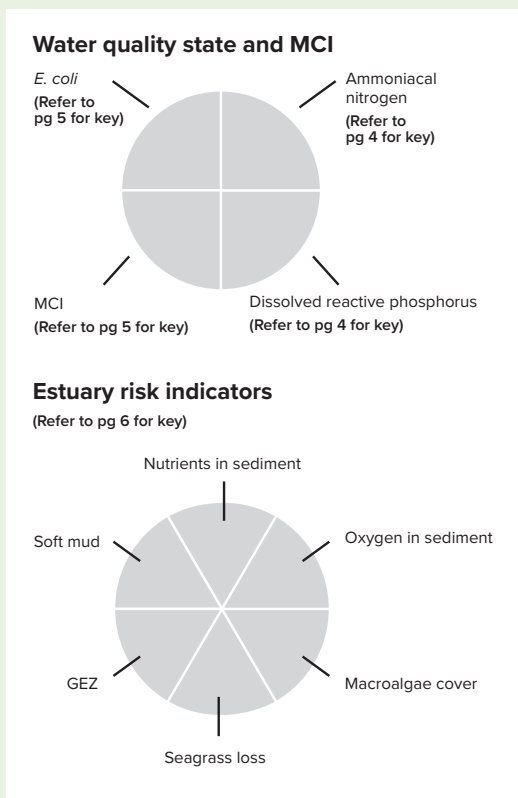
The below assessment of estuary health based on the sediment quality gives a good indication of what is happening upstream across all catchments that feed into waterways supplying the estuary and therefore impact on the ecosystems and the cultural values of the area.

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.

Maitara Catchment with estuaries and surface water quality monitoring sites



*sites in Wendonside 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.

Central parts of the Wendonside Catchment falls into the old Mataura physiographic zone, which has high levels of nitrate in groundwater in some areas. Northern areas of the catchment fall into the alpine and bedrock/hill country physiographic zones. The rest of the catchment is a mosaic of gleyed, riverine and oxidising physiographic zones (see map below). These zones differ in the way contaminants are transported and attenuated within the catchment.



Wendonside Catchment showing physiographic zones

Bedrock/Hill country – overland flow

This zone is found on rolling to steep land below 800 metres. It is characterized by high rainfall and a dense network of branching streams.

Water quickly flows down-slope to nearby streams following high or prolonged rainfall. Nitrogen, phosphorus, sediment and faecal microorganisms are all carried with water, particularly during late autumn and winter.

Bedrock/Hill country – artificial drainage

Generally located on developed land along the base of hillslopes. Artificial drainage is needed in areas of low slope and low subsoil permeability.

Riverine

Located along the margins of major rivers, this zone is characterized by shallow, stony soils that drain quickly to underlying shallow aquifers. This zone transports contaminants, particularly nitrogen, to coastal estuaries and lagoons.

Oxidising

Soils and aquifers in this zone have high risk of nitrogen build-up due to low rates of denitrification. 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'.

The combination of flat land and well drained soils results in high rates of nitrogen leaching (deep drainage) to underlying aquifers.

Alpine

This zone occupies land above 800 metres elevation. It is steeply sloping, with high rainfall and snow. There is limited loss of nutrients and faecal microbial contamination from this zone due to low land use intensity.

Old Mataura

This zone has low denitrification potential in soils and aquifers. As a result, nitrate levels can accumulate to high concentrations.



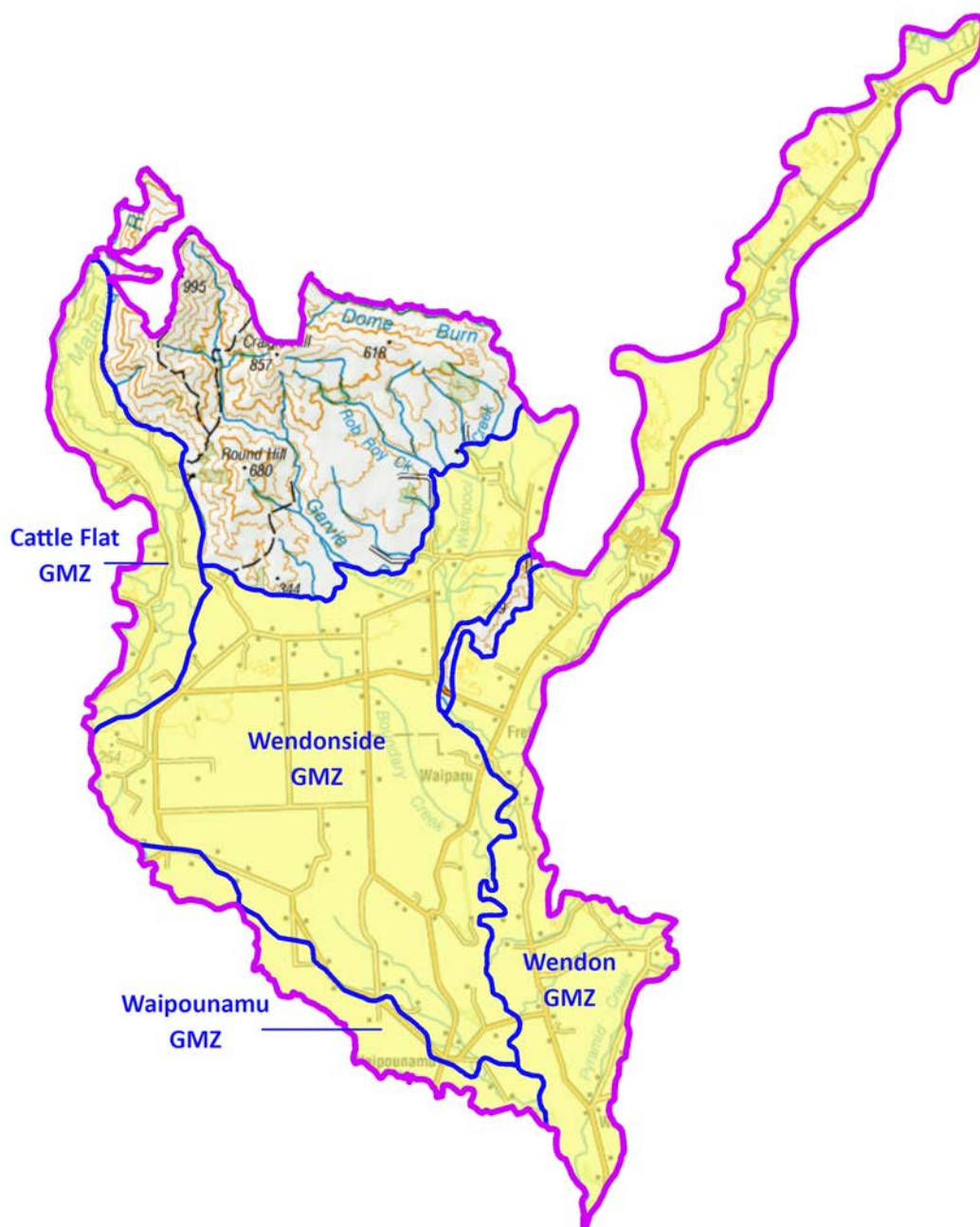
Gleyed

This zone is generally found in areas that were once wetlands. It is characterized 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.

GMZ – Wendonside

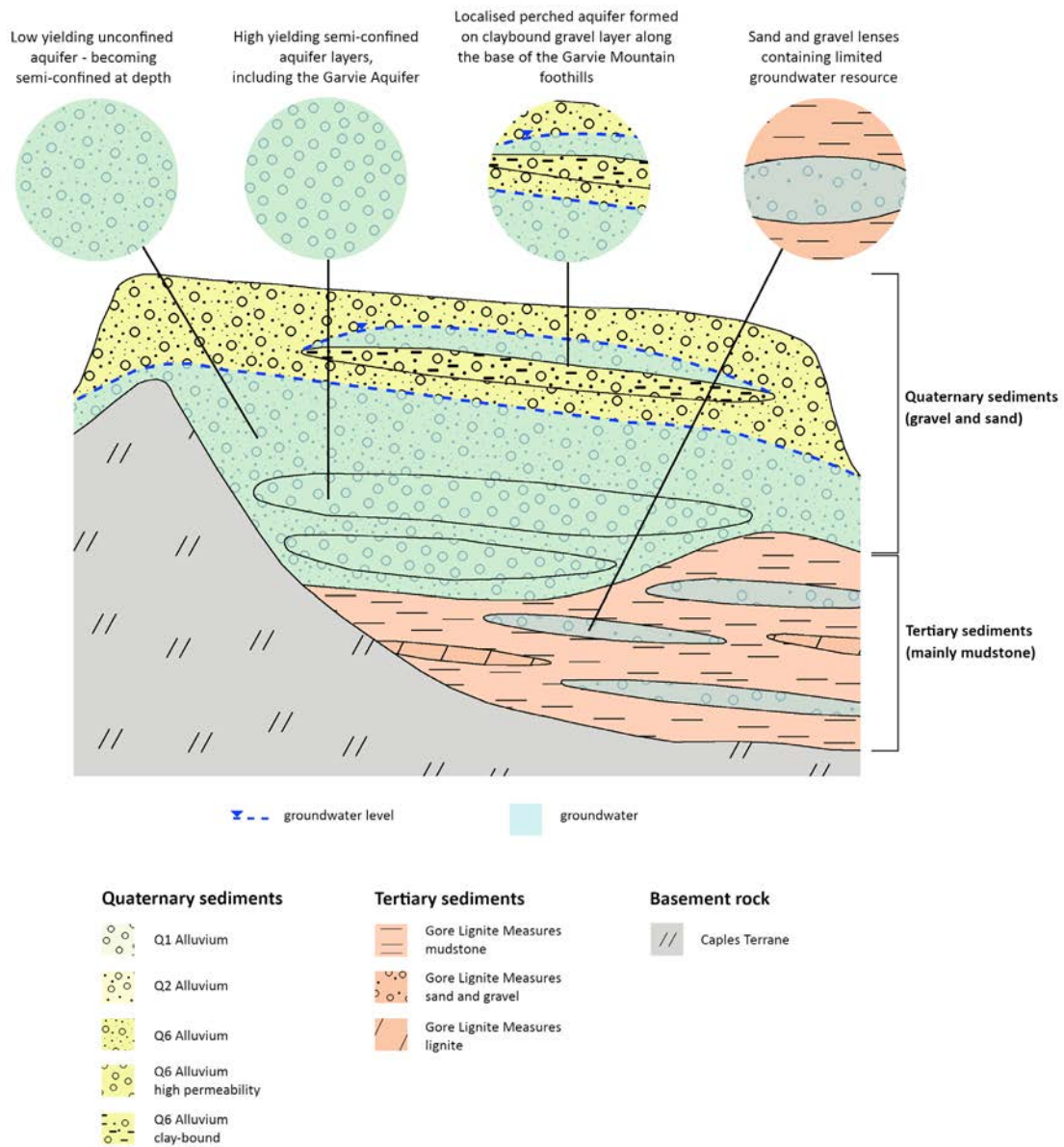
The Wendonside Catchment overlies the Wendonside and Wendon GMZs. The catchment also overlies part of the Cattle Flat GMZ in the north-west and part of the Waipounamu GMZ in the south-west.



Wendonside GMZ

The Wendonside GMZ covers approximately 13,000 ha, between the Mataura and Waikaia Rivers:

- » Depth to groundwater ranges from three-five metres below ground level around the northern margin of the Wendonside Terrace, to 15-20 metres below ground in central areas, and up to 30 metres below ground level in some places
- » Seasonal groundwater variation is generally two-three metres
- » A limited confined area of groundwater is found along the Garvie Mountain foothills
- » See below for a diagrammatic cross-section of this GMZ showing areas of groundwater (source es.govt.nz/environment/water/groundwater/groundwater-management-zones/wendonside)
- » Groundwater recharge in this zone is derived from local rainfall and runoff from the southern flanks of the Garvie Mountain foothills that soaks through the soil. Groundwater discharge mostly flows to Waikaia River, downstream of Waiparu.



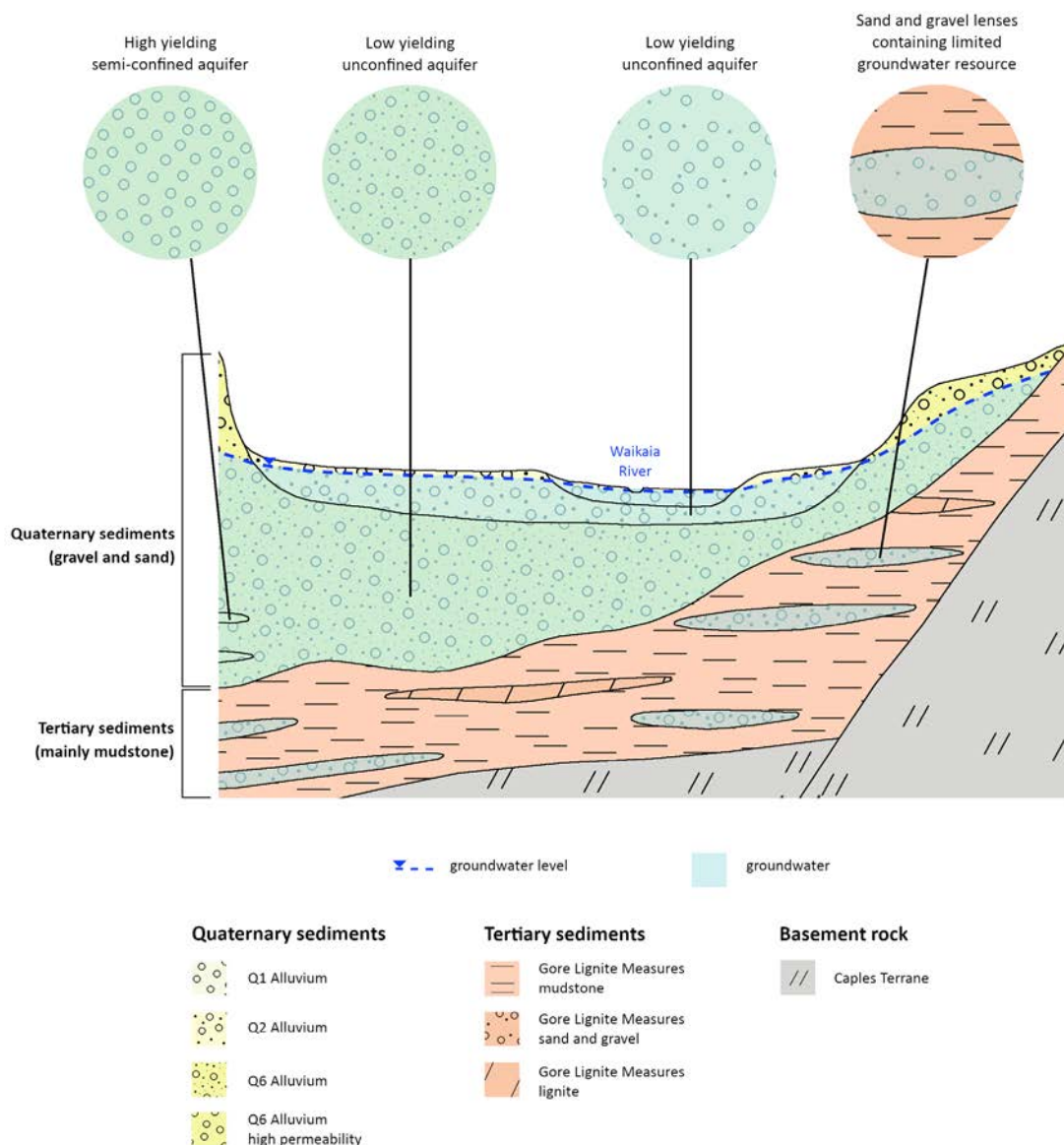
Groundwater quality Wendonside GMZ

- » Nitrate = moderate to very high in some areas
- » Phosphorus = low
- » *E. coli* = low risk due to depth of groundwater.

Wendon GMZ

The Wedon GMZ covers approximately 9,000 ha. This zone flanks the Waikaia River between Piano Flat and the Matura River confluence:

- » Depth to groundwater ranges from two metres below ground level along the margins of the Waikaia River to upwards of five metres under higher terraces
- » Seasonal groundwater variation is generally less than a metre with highest groundwater levels occurring after heavy rainfall
- » See below for a diagrammatic cross-section of this GMZ showing areas of groundwater (source [es.govt.nz/environment/water/groundwater/groundwater-management-zones/wendon](https://www.es.govt.nz/environment/water/groundwater/groundwater-management-zones/wendon))
- » Groundwater recharge in this zone is derived from local rainfall and runoff from the eastern hills that soaks through the soil. Groundwater discharge mostly flows to Waikaia River.



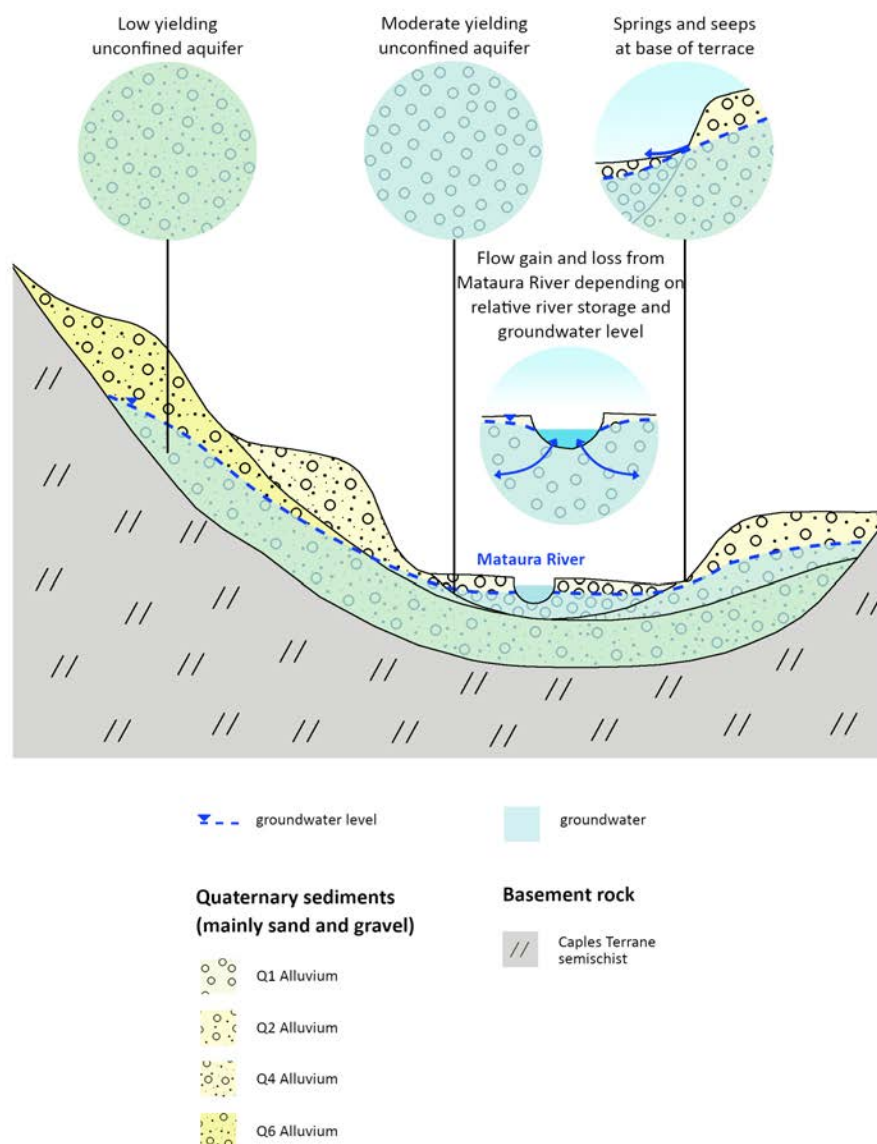
Groundwater quality Wedon GMZ

- » Nitrate = low to moderate, but risk is elevated towards valley margins
- » Phosphorus = low
- » *E. coli* = low risk.

Cattle Flat GMZ

The Cattle Flat GMZ covers approximately 3,000 ha in the Matura River valley between Ardlussa and Nokomai Gorge:

- » Depth to groundwater ranges from two metres below ground level along the margins of the Matura River increasing upwards of five metres under higher terraces
- » Seasonal groundwater variation is generally less than two metres
- » See below for a diagrammatic cross-section of this GMZ showing areas of groundwater (source es.govt.nz/environment/water/groundwater/groundwater-management-zones/cattle-flat)
- » Groundwater recharge in this zone is derived from local rainfall and runoff from the surrounding hills that soaks through the soil. Groundwater discharge mostly flows as baseflow to the Matura River.



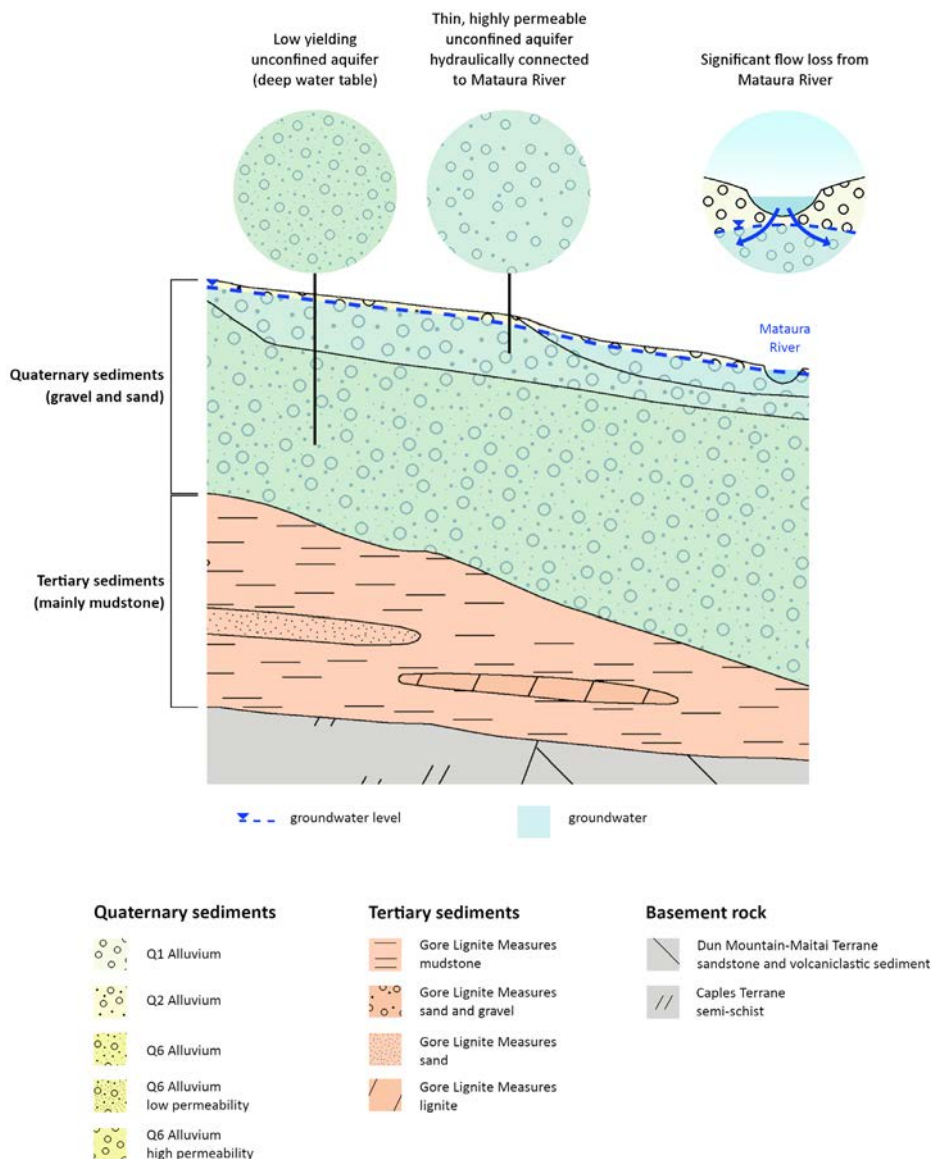
Groundwater quality Cattle Flat GMZ

- » Nitrate = low to moderate
- » Phosphorus = low
- » *E. coli* = low, but risk can be elevated close to source.

Waipounamu GMZ

The Waipounamu GMZ covers approximately 1,750 ha along the northern margin of the Matura River between Ardlussa and the Waikaia River confluence:

- » Depth to groundwater ranges from two metres below ground level along the margins of the Matura River increasing upwards of five metres under higher terraces
- » Seasonal groundwater variation is generally less than two metres
- » See below for a diagrammatic cross-section of this GMZ showing areas of groundwater (source es.govt.nz/environment/water/groundwater/groundwater-management-zones/waipounamu)
- » Groundwater recharge in this zone is derived from local rainfall that soaks through the soil, and throughflow of groundwater from the Wendonside GMZ to the north. There is also a high level of connection with Matura River with water flowing between the river and the aquifer depending on relative water levels. Groundwater discharge mostly flows as baseflow to the Matura River and the lower reaches of the Waikaia River.



Groundwater quality Waipounamu GMZ

- » Nitrate = low to moderate
- » Phosphorus = low
- » *E. coli* = low.



Find out more

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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