Giving effect to the National Policy Statement for Freshwater Management – report on website review and update for second round of community engagement

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Executive summary

As part of the process of giving effect to the National Policy Statement for Freshwater Management 2020 (NPSFM), every regional council must follow the National Objective Framework (NOF) and is required to have long term visions for freshwater in its region. Under Sub part 1, section 3.3(3)(b) of the NPSFM, every long-term vision must be informed by an understanding of the history of, and environmental pressure on, the Freshwater Management Unit (FMU), part of the FMU, or catchment.

In addition to this, Sub part 1, section 3.3(4) states that every regional council must assess whether each FMU, part of an FMU, or catchment can provide for its long-term vision, or whether improvement to the health and well being of water bodies and freshwater ecosystems is required to achieve the vision. For this reason, the historical and current freshwater context in each FMU is pertinent to the NPSFM, as this data provides understanding of whether improvement to the waterbodies and ecosystems is required.

Marlborough District Council (the council) is currently partway through three rounds of community engagement related to the implementation of the NPSFM and the NOF. The first round of engagement took place between December 2022 and June 2023, focusing on proposed FMUs and gaining an understanding of the community's values and aspirations for the region's freshwater and freshwater ecosystems. As part of the first round of engagement, "Freshwater Management" pages were created on the council website. The pages were a combination of background information to the NPSFM, public feedback discussion, and a summary of general information held for each FMU.

The second round of engagement will run from 3 November 2023 through to 15 December 2023. This round is focused on providing strawman visions and environmental outcomes for each FMU, informed by the history of land and water and environmental pressures in these areas as required under Sub part 1, s 3.3(3)(b) and s 3.3(4) (the sections). This report details the council's approach, process, and information used in public documentation that will be shared with the community to inform public feedback as part of the second round of community engagement.

To provide the public with enough background information to understand why these visions and environmental outcomes were being proposed, and to meet the requirements of the sections, the council's "Freshwater Management" website pages were updated for each FMU. This involved creating the following new and separate subpages, described in the list below.

This report will focus on pages 1-3, as these provided information which met the requirements of the sections outlined above. The website update utilized the existing work.

1. FMU history and characteristics
2. Historic freshwater state

3. Current freshwater state
4. Proposed Visions
5. Proposed Values
6. Proposed Environmental outcomes

Information provided in pages 1-3 is further described as:

1. Historical and current land use: a summary from pre-human through to current day of the land use and cover types, predominant farming systems, areas of urban use, and associated trends and changes, supported by charts, maps, and graphs.
2. Historic freshwater state: a summary of the last approximately 30 years of council, central government, and (where possible) external data which showed the water quality and quantity state in the FMU excluding the most recent five years. This enabled the public to understand the history of freshwater in the FMU and any identified trends or changes. The information was supported by charts and graphs as required.
3. Current freshwater state: a summary of the most recent five years of council, central government, and (where possible) external data which presents the most up to date trends in water quality, quantity, environmental pressures, and use in each FMU. The information was supported by charts and graphs as required.

Contents

NPSFM 2020 and NOF requirements

1 As part of the process of giving effect to the National Policy Statement for Freshwater Management 2020 (NPSFM) every regional council must follow the National Objectives Framework (NOF) (Part 3, Subpart 2, Clause 3.7). This prescribes a step-by-step process for managing freshwater.

2 The NOF process has six steps (Table 1) and requires that at each step every regional council must engage with communities and tangata whenua (Clause 3.7(1)(a)).

NOF Step	Process	Clause
1	Identify Freshwater Management Units (FMUs) in the region.	3.8
2	Identify values for each FMU.	3.9
3	Set environmental outcomes for each value and include them as objectives in regional plans.	3.9
4	Identify attributes for each value and identify baseline states for those attributes.	3.10
5	Set target attribute states, environmental flows and levels, and other criteria to support the achievement of environmental outcomes.	3.11, 3.13, 3.16
6	Set limits as rules and prepare action plans (as appropriate) to achieve environmental outcomes.	3.12, 3.15, 3.17

Figure 1 - Table of NOF steps

3 Together with the NOF, the NPSFM also requires every regional council to have long-term visions for freshwater in its region which must be developed through engagement with communities and tangata whenua (Clauses 3.3 (1) and (3)(a)).

4 The long-term visions must be informed by an understanding of the history of, and environmental pressure on, the Freshwater Management Unit (FMU), part of the FMU, or catchment. (Sub part 1, section 3.3(3)(b)).

5 The historical and current freshwater situation in each FMU is therefore pertinent to the NPSFM as this data will provide for the understanding of whether improvement to the waterbodies and ecosystems is required, as stated under Sub part 1, section 3.3(4).

6 Under Subpart 2, section 3.10 of the NPSFM, the council must identify attributes for all values – either the compulsory values or those which are identified by tangata whenua and the community through the community engagement.

7 The attributes requiring limits on resource use are defined in Appendix 2A of the NPSFM. Some of these attributes are currently monitored as part of the council's State of the Environment (SOE) Surface Water Quality monitoring programme across all six proposed FMU, with reporting on five FMU as at the 2023 SOE report.

Council's approach and process

8 This report describes the Marlborough District Council's (the Council's) process and resulting decision on the content of public information, related to the history of land and water use, quality, and quantity, as well as the known environmental pressures in each proposed FMU, released by the council for the second round of community engagement on the NPSFM implementation.

9 The council is required to share this information so that the public can be informed about the history of each FMU's land use and environmental pressures and be adequately informed to participate in the engagement.

10 In tandem, Council is undertaking engagement with tangata whenua with the aim of understanding the history and land use of each FMU by tangata whenua, both in a historical and current context.

11 Council staff considered what information would be most applicable to meet the requirements in the sections, and additionally which information would be most useful for the community to have for the second round of community engagement, from 3 November to 15 December (Figure 2).

Figure 2 - Timeline of community engagement

12 For practical purposes, summarised information with links through to full reports in other areas of the council website was the most realistic option. For ease of reading, three website pages were decided:

1) FMU history and land use
2) Historic Freshwater State
3) Current Freshwater State

13 Each of the three topics above had a new website page developed. These pages were linked from infographic tiles which were set on each FMU's landing page (Figure 1, top row). The infographics were identical across all FMU landing pages for clarity.

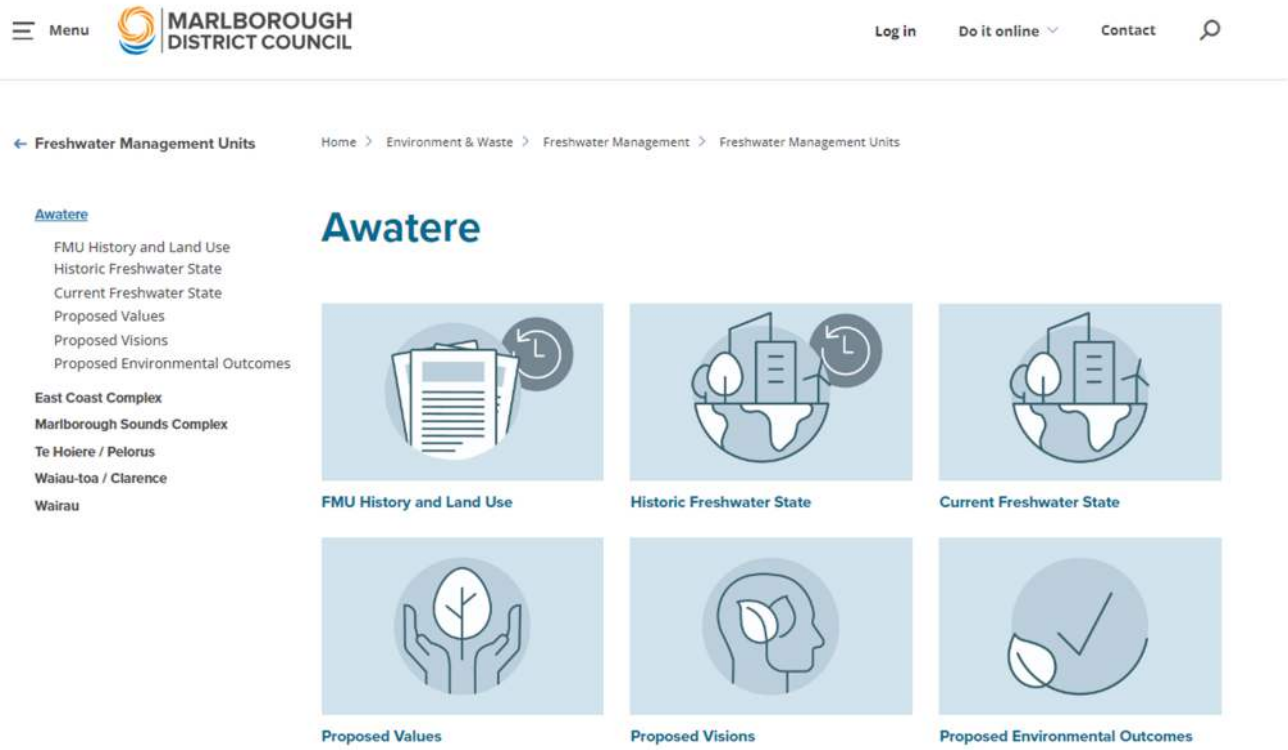


Figure 3 - FMU landing page with infographic tiles

14 The three new freshwater pages were developed to help explain:

- The history of land use and land cover in the area, from prehuman settlement through to the current day. This included identified significant events and/or trends, e.g., viticulture development, and utilised information already available on the preceding FMU pages from the first round of public engagement.
- Summaries on historic water quality and quantity information sourced primarily from existing council documents and publications.

- Summaries on the most up to date water quality and quantity information sourced primarily from existing council documents and publications.

15 Three separate webpages were considered to be the most useful option. This was due to recognition that some people would want to read only the most up to date, current freshwater situation in an FMU, while others would want a more in depth, historical discussion. Additionally, the FMU history and land use would not appeal to everyone, as many members of the public would already be familiar with these matters in their own areas and may not wish to read this information. However, given the requirements under the sections and the fact that not all people would have an understanding of the history and land use of all FMU, these pages were included.

16 A further reasoning for separate pages was structural longevity; enabling future updates of each page as new water quality and quantity monitoring and reporting is completed. In this way, each FMU is 'future proofed' and easily updated each year as SOE results are provided by council staff.

17 Decisions on which information to include on the pages considered several parameters:

- Quality of the information
- Length of the monitoring and reporting time – precedence given to long standing programmes which had a wealth of information
- Ease of information and document accessibility – preference to publicly accessible reports written for the community

18 For example, the State of the Environment (SOE) freshwater programmes were chosen for the summary pages as these are well established in Marlborough, with some having been monitored since 2007. These SOE programmes have established monitoring sites, reporting structures, and documents which are already publicly available on the council website. The reports are written for public readership and considerable effort by council staff has already been undertaken to make these comprehensive documents as understandable as possible.

19 Accordingly, these programmes have derived clear trends and quality/quantity information over time and form a good basis for discussion with the public as part of the community engagement. Having a full published report also meant that a short summary on the updated website pages was all that was required, as the public was also linked through to the entire document.

20 An important part of the “Current Freshwater State” pages for each FMU was a summary of the most recent data for the NPSFM attributes defined in the NOF. These attributes are currently measured for surface water as part of the SOE surface water monitoring programme as discussed in paragraph 7. There is now enough information to compare the 2020 and 2023 report datasets for these attributes across most FMU in the region. An example is shown on Figure 6 below.

Information provided on the webpages

21 The FMU history and land use pages summarised the following information:

- Estimated prehuman land cover and resulting trends/changes over time to the current day.
- Information on geology, soils, climate, rainfall, and water bodies.
- History of urban and rural land uses – farming, settlements, towns, trends of areas e.g., viticulture

22 The historic and current freshwater pages summarised the following monitoring results and reports for water quality and quantity:

- Water quality – State of the Environment Surface Water and Groundwater quality monitoring, Recreational Water Quality Monitoring, Catchment Studies, Special Investigations, Coastal sentinel well monitoring, National Pesticide monitoring.
- Water quantity – Data on numbers of issued Resource Consents for water take activities, flow allocation and limits as defined in the Proposed Marlborough Environment Plan (pMEP), hydrological data on river flow, Aquifer studies.

23 Relevant information from the chosen sources was also presented in graph, image, and chart format as this was more digestible for the public than solely text paragraphs. Examples include planted areas of vineyard shown in graphs (Figure 4), land cover shown in FMU maps (Figure 5), and NPSFM attributes shown as charts (Figure 6). Visual imagery such as photographs were also included.

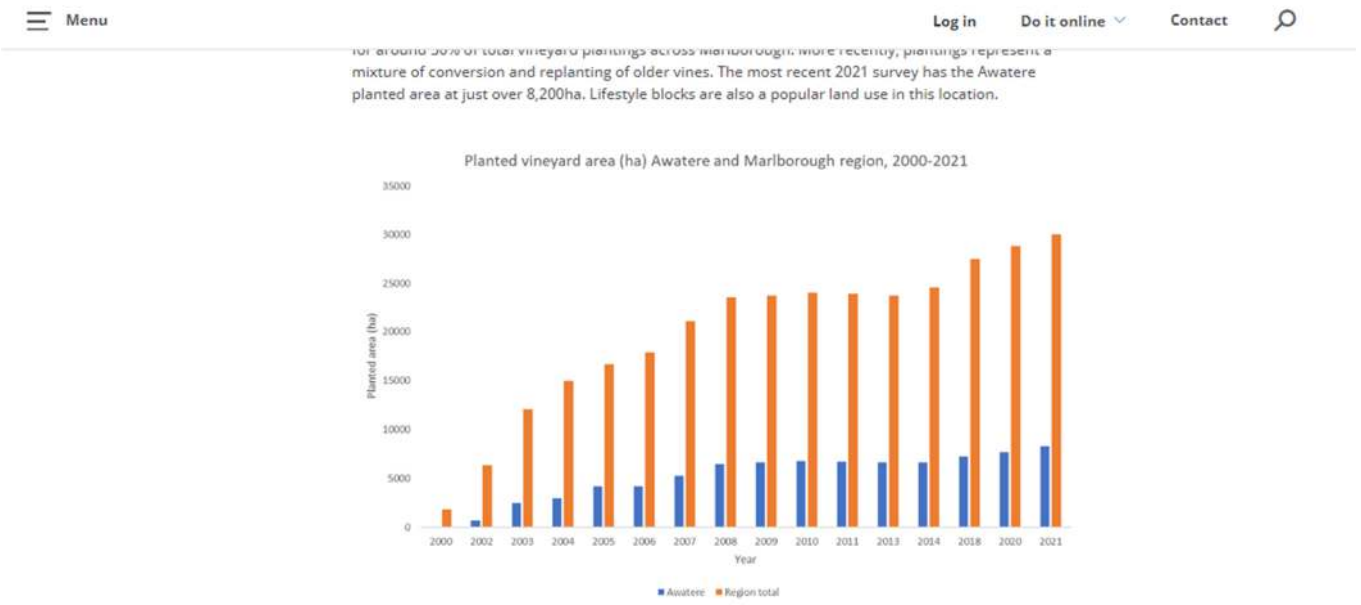


Figure 4 - Graphs of vineyard planting area

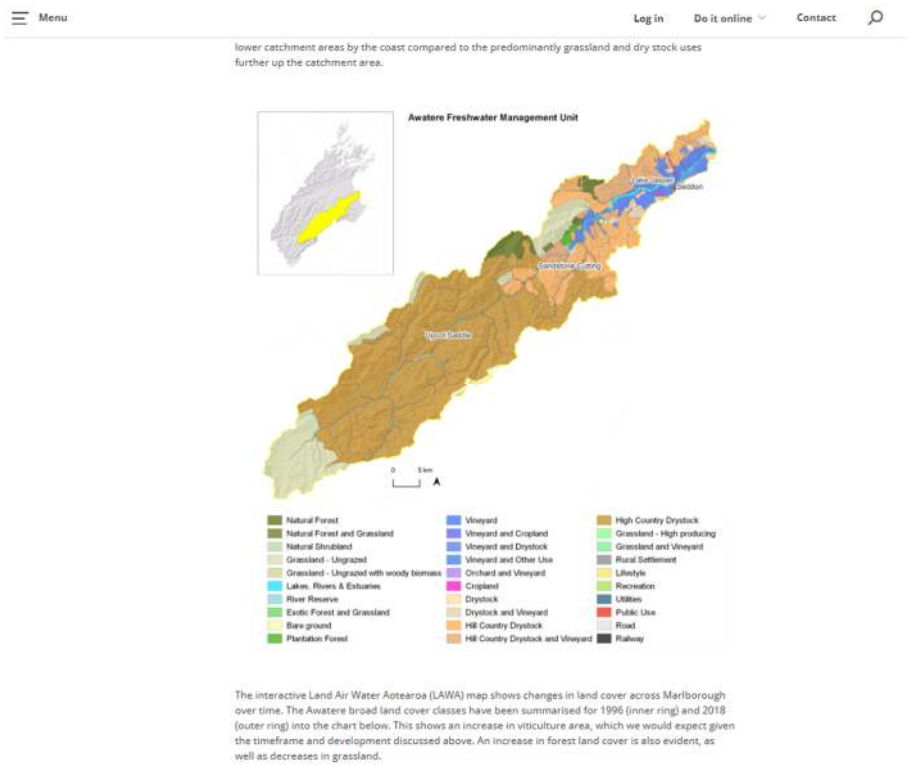


Figure 5 - Land cover shown in map form

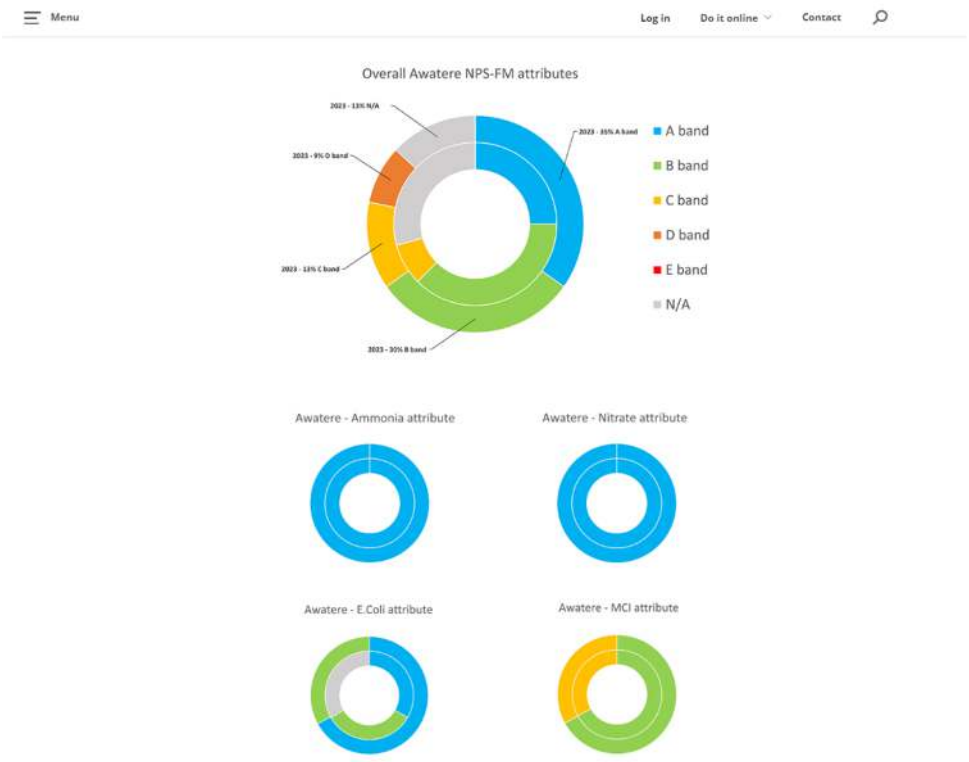


Figure 6 - NPSFM monitoring attribute results as charts

24 Tables were also used to summarise monitoring results and to duplicate information from the pMEP, which enabled the public to read pMEP details without having to open the full appeals version – although this was also linked in relevant areas (Figure 7).

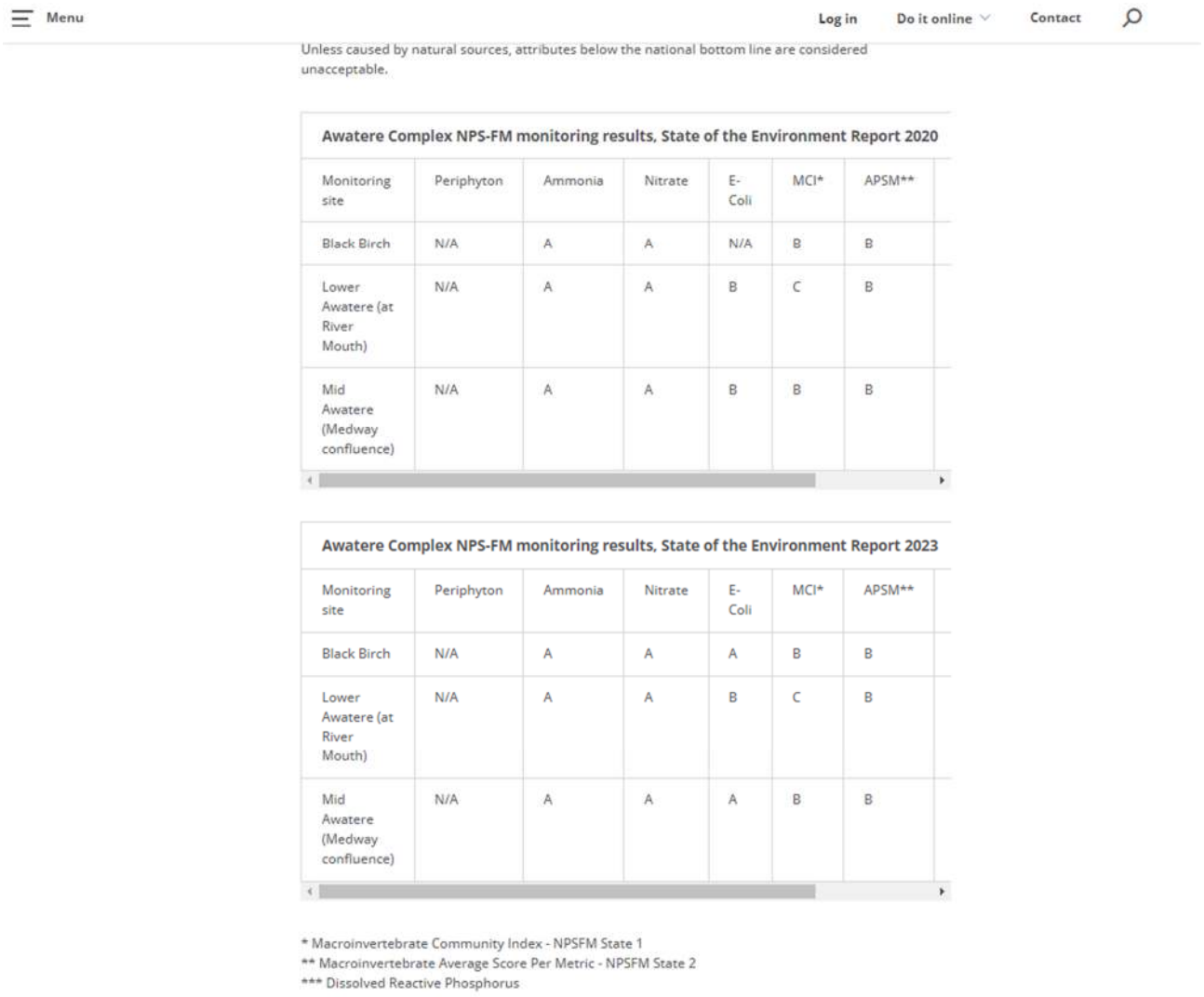


Figure 7 - Monitoring results summarised in table form on the website

25 The land cover FMU and regional maps were produced by external consultants, Dr Lisa Pearson and Emma Moran, as part of a wider work programme. Other external sources of information included Land Air Water Aotearoa (LAWA), Department of Conservation (DoC), and Pattle Delamore Partners (PDP). However, most information on all three pages was sourced from documentation either existing on the council website, archive, or directly from staff members.

Appendix 1 – Existing FMU webpages

The existing Freshwater Management website pages are shown below. These were updated for the first round of community engagement. The red circled FMU tile leads to the page shown in Figure 9. The other pages shown in Figure 8 had minor amendments for the second round of engagement but largely stayed the same.

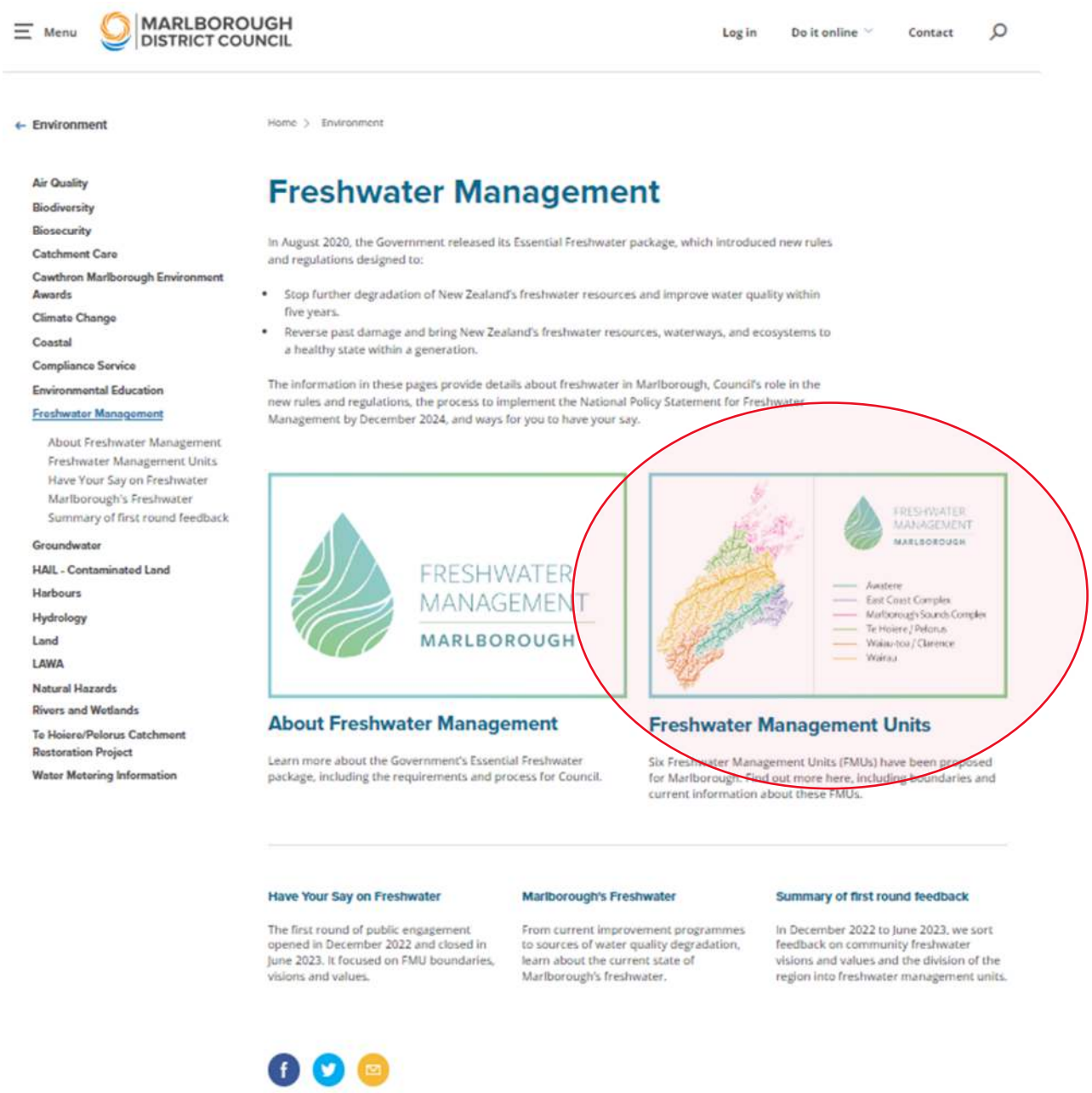


Figure 8 - Existing Freshwater Management website landing page – red tile links to Figure 8

Figure 9 below shows the existing Freshwater Management Unit website page with the individual FMU linked through image tiles. The red circled “Awatere” tile links through to the page shown in Figure 10.

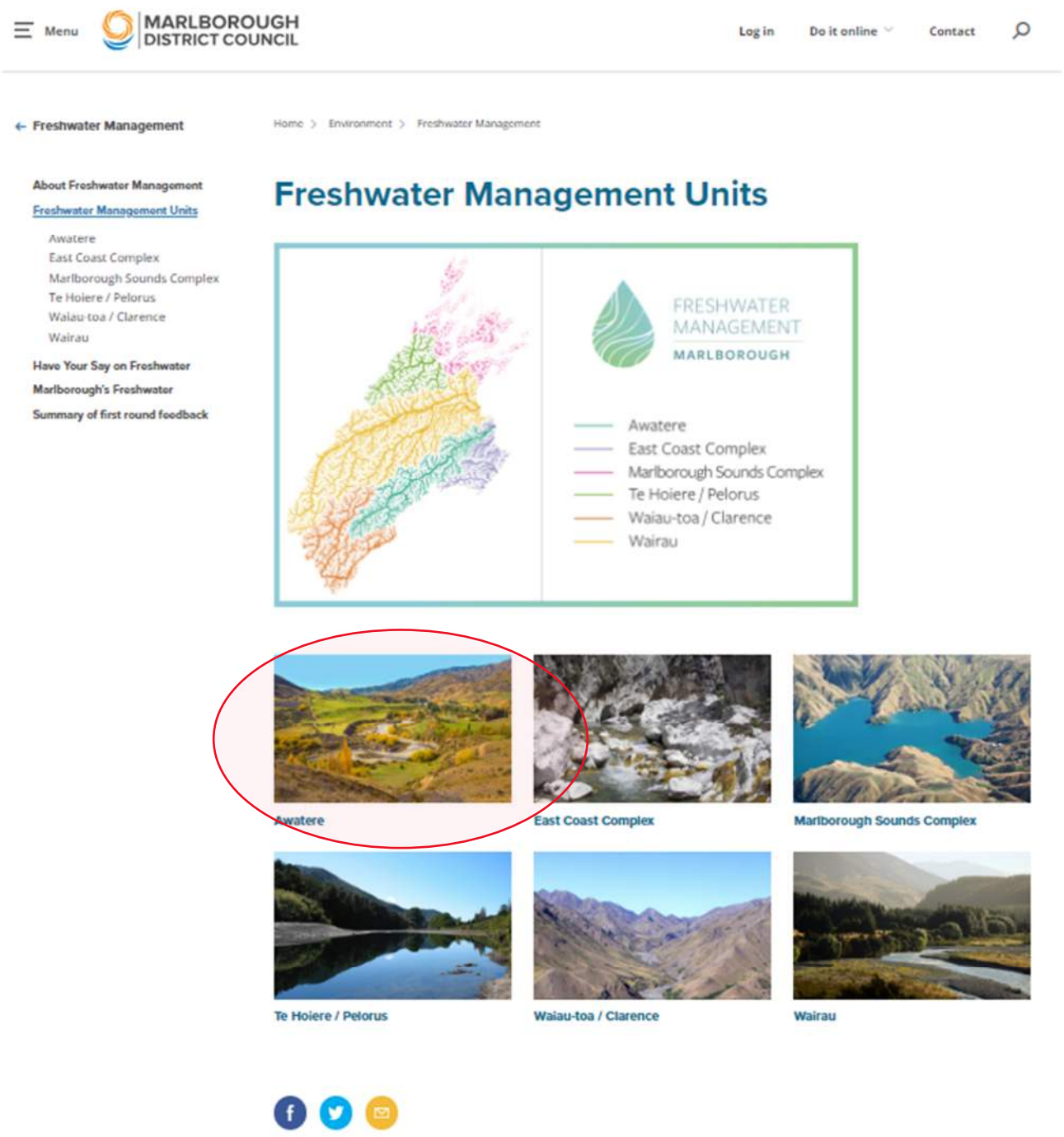


Figure 9 - Existing FMU landing page – red tile links to Figure 9

Figure 10 is an example of the existing FMU page, which included information on climate, geology, and comments on freshwater management. Some of this content was retained on the new website pages or reworked into new formats such as diagrams.

Figure 10 - Existing sample of individual FMU page

Appendix 2 – New website pages, Awatere FMU

Menu MARLBOROUGH DISTRICT COUNCIL Log in Do it online Contact

← Freshwater Management Units

Home > Environment > Freshwater Management > Freshwater Management Units > Awatere

Awatere

- FMU History and Land Use
- Historic Freshwater State
- Current Freshwater State
- Proposed Values
- Proposed Visions
- Proposed Environmental Outcomes

East Coast Complex

Marlborough Sounds Complex

Te Hoiere / Pelorus

Waiau-toa / Clarence

Wairau

FMU History and Land Use

On this page

Climate

The climate of the Awatere FMU is similar to eastern Marlborough and is classed as warm and temperate. It has a moderate supply of moisture, an average temperature of 10.8°C and mean annual rainfall of 500 to 1490 mm. Rainfall is lowest in the coastal area on the south side of the Awatere River, increasing inland and on the north side of the river due to the rain shadow effect of the northern hills. Rainfall is typically greatest in the months of July and August with the least amount of rainfall generally in February.

Geology and soils

Geology in the lower Awatere FMU is dominated by soft mudstones and conglomerates from the late Miocene and Pliocene epochs, which are easily erodible giving the river its typically silty appearance. The higher peaks further up the valley are predominately greywacke with some volcanic intrusions. The major geological feature responsible for the Awatere Valley and its notable straightness is the Awatere Fault, a branch of the Alpine Fault that stretches over 200 kilometres.

Recreation along the Awatere River

Photo by MarlboroughNZ

Soils in the lower Awatere Valley display a fragmented soil pattern from the active tectonic environment and river downcutting that has resulted in numerous terraces. The soils in this lower area are dominated by former river alluvium with half being shallow and stony. On the southern side of the Awatere River, loess of variable thickness covers the higher elevation river terraces.

Bodies of water

The Awatere River has several major tributaries, as well as many smaller tributaries and streams. The most notable to the north are Castle River, Grey River and Blairich River. To the south are the Tane River, Hodder River and Medway River. Other prominent streams in the lower Awatere Valley include Black Birch Stream and Starborough Creek. There are no large lakes in the catchment, but smaller lakes, such as Lake Jasper and multiple significant wetlands, have been identified throughout the FMU.

← Freshwater Management Units

Awatere
- FMU History and Land Use
- Historic Freshwater State
- Current Freshwater State
- Proposed Values
- Proposed Visions
- Proposed Environmental Outcomes

East Coast Complex
Marlborough Sounds Complex
Te Hoiere / Pelorus
Waiau-toa / Clarence
Wairau

Home > Environment > Freshwater Management > Freshwater Management Units > Awatere

Historic Freshwater State

On this page

Water quality

Surface Water Quality – WQI measures

Surface water, being above ground waterways, are easily recognizable across the Marlborough landscape - such as our iconic braided rivers. Surface water courses gain their flow through catchment areas as well as underground springs in some cases. A catchment is the area of land from which all rainfall and streams flows out into a river, a lake or the sea. The catchment of large rivers, such as the Awatere River, can be divided into smaller sub-catchments, which usually represent the tributaries.

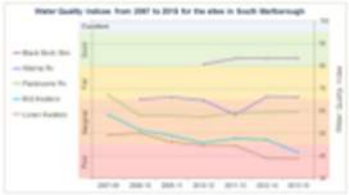
The Surface Water Quality State of the Environment (SOE) monitoring has been operational in Marlborough since 2007. The programme measures 56 sites regionally, three of which are in the Awatere FMU.

The Water Quality Index (WQI) serves as a consolidated score reflecting the quality of river water. It is derived from nine chemical and physical parameters measured on a monthly basis. The WQI ranges from 0 to 100 with higher values indicating better water quality. The WQI simplifies comparisons of water quality across various waterways and serves as a valuable tool for identifying degraded waterways and prioritising improvement actions.

The five index classes represent water quality, with "marginal" and "poor" categories requiring improvement. The higher the index number, the better the water quality and accordingly the closer to "excellent" WQI rating. Read more about our surface water SOE monitoring programme below:

Go to the SOE monitoring programme page

The table below shows the historical WQI indices for the Awatere FMU monitoring sites. This data is also shown on the graph to the right - please note this graph is historic; the Waima River and Flaxbourne River are not part of this FMU area. The WQI for the Black Birch, Mid Awatere and Lower Awatere monitoring sites are summarised into the chart.

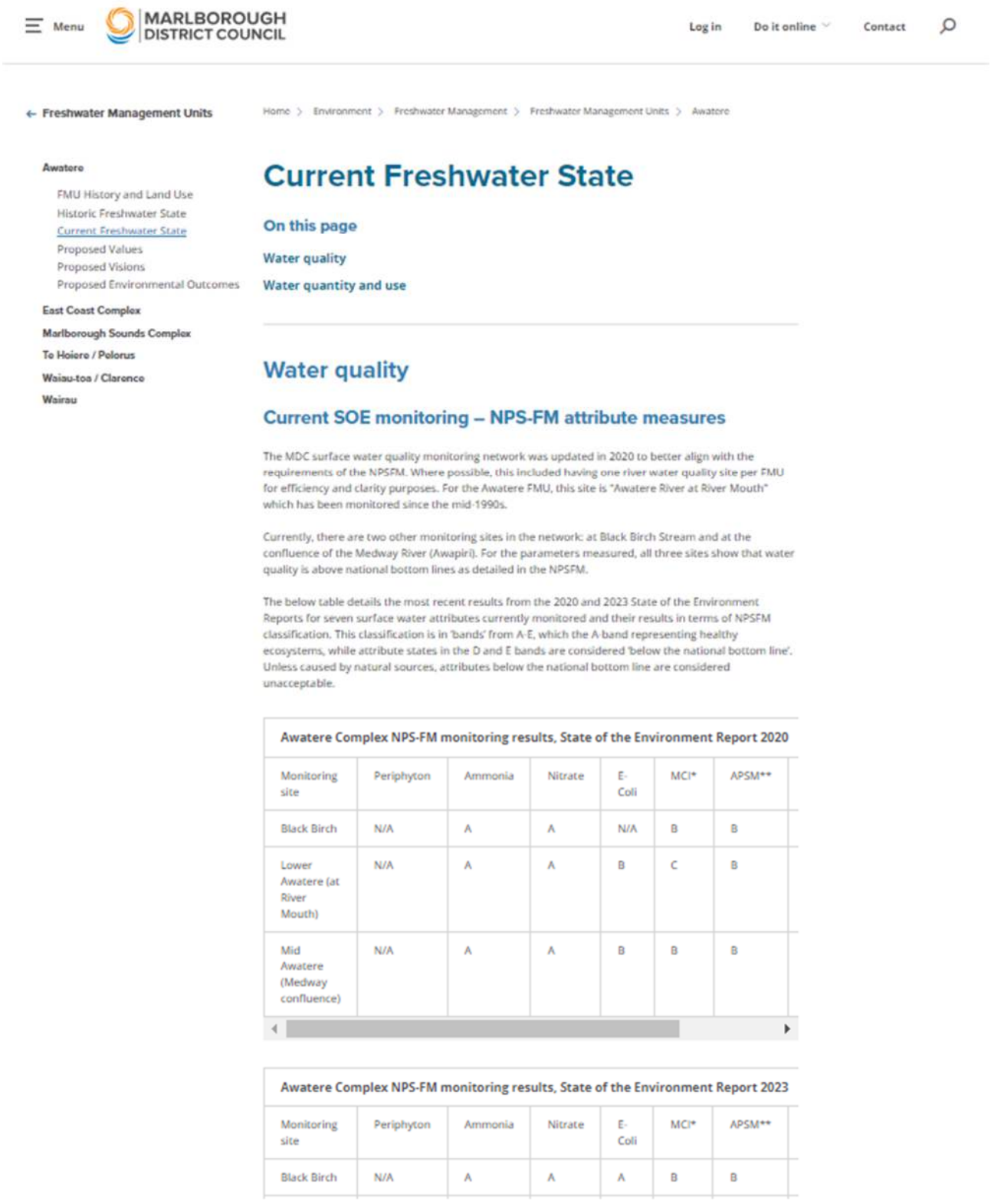


WQI graph, South Marlborough 2007 - 2015

We can see from the graph that the WQI at Black Birch site has remained unchanged or improving. In contrast, the mid and lower Awatere WQI indices gradually declined in the mid-2010s. We can also see from the below chart that a large proportion of the indices were in the 'marginal' or 'poor' categories.

The 2016 surface water SOE report provides insight as to the decline in water quality at the mid and lower Awatere monitoring sites at this time:

"Black Birch Stream flows into the Awatere River, which has substantially poorer water quality. However, the parameters which cause the greatest reduction in the Water Quality Index are elevated predominantly due to natural causes. High turbidity and pH values are the result of high mudstone and limestone content in the geology of the Awatere River catchment. Nevertheless, there is a large amount of infrastructure associated with irrigation water takes in the lower Awatere.



Menu MARLBOROUGH DISTRICT COUNCIL Log in Do it online Contact

← Freshwater Management Units

Home > Environment > Freshwater Management > Freshwater Management Units > Awatere

Awatere
- FMU History and Land Use
- Historic Freshwater State
- Current Freshwater State
- Proposed Values
- Proposed Visions
- Proposed Environmental Outcomes

East Coast Complex
Marlborough Sounds Complex
Te Hoiere / Pelorus
Waiau-toa / Clarence
Wairau

Current Freshwater State

On this page

Water quality

Water quantity and use

Water quality

Current SOE monitoring – NPS-FM attribute measures

The MDC surface water quality monitoring network was updated in 2020 to better align with the requirements of the NPSFM. Where possible, this included having one river water quality site per FMU for efficiency and clarity purposes. For the Awatere FMU, this site is "Awatere River at River Mouth" which has been monitored since the mid-1990s.

Currently, there are two other monitoring sites in the network: at Black Birch Stream and at the confluence of the Medway River (Awapiri). For the parameters measured, all three sites show that water quality is above national bottom lines as detailed in the NPSFM.

The below table details the most recent results from the 2020 and 2023 State of the Environment Reports for seven surface water attributes currently monitored and their results in terms of NPSFM classification. This classification is in 'bands' from A-E, which the A band representing healthy ecosystems, while attribute states in the D and E bands are considered 'below the national bottom line'. Unless caused by natural sources, attributes below the national bottom line are considered unacceptable.

Awatere Complex NPS-FM monitoring results, State of the Environment Report 2020

Monitoring site	Periphyton	Ammonia	Nitrate	E-Coli	MCI*	APSM**
Black Birch	N/A	A	A	N/A	B	B
Lower Awatere (at River Mouth)	N/A	A	A	B	C	B
Mid Awatere (Medway confluence)	N/A	A	A	B	B	B

Awatere Complex NPS-FM monitoring results, State of the Environment Report 2023

Monitoring site	Periphyton	Ammonia	Nitrate	E-Coli	MCI*	APSM**
Black Birch	N/A	A	A	A	B	B

Appendix 3 – New website pages, East Coast Complex FMU

Menu MARLBOROUGH DISTRICT COUNCIL Log in Do it online Contact

← Freshwater Management Units

Home > Environment > Freshwater Management > Freshwater Management Units > East Coast Complex

Awatere
East Coast Complex
- FMU History and Land Use
- Historic Freshwater State
- Current Freshwater State
- Proposed Values
- Proposed Visions
- Proposed Environmental Outcomes

Marlborough Sounds Complex
Te Hoiere / Pelorus
Waiau-toa / Clarence
Wairau

FMU History and Land Use

On this page

Climate

The climate of the East Coast Complex is one of the driest in Marlborough, with low annual rainfall of between 600 and 700mm. High evaporation rates are caused by hot temperatures in summer combined with strong north-westerly winds. Rainfall does increase towards the southwestern, more mountainous part of the FMU with mean annual rainfalls of 1,200mm.

Geology and soils

Geology in the FMU is complex and includes a range of rock types that have been modified by folding and faulting. The rocks in the northern part of the FMU are known as the Ward Syncline which comprise layers of mudstone rocks, thousands of metres thick, folded into a basin shape. This is overlain by a thin veneer of aquifer-forming gravels. The basement rock mudstones are known as *papa-rock* and occur along with greywacke, sandstone, and rarer carbonaceous rocks.

Moving south, the Flaxbourne catchment is also dominated by folded sedimentary rock. Most of the upper catchment consists of Pahau basement sandstone, which also contains mudstone, basalt and limestone. Towards the coast, the surface geology is dominated by alluvial gravels among pockets of exposed siltstone. Furthest to the east, sandstone and limestone have formed in narrow bands parallel to the coast, which are seen as coastal outcrops at Chancet Rocks and Needles Point. Limestone geology then becomes dominant in the Waima (Ure) catchment in the southern part of the FMU with steep valleys and gorges.

Bodies of water

The northern part of the FMU which encapsulates a number of small streams including the Boundary stream and Toe Toe Creek, are now proposed to be part of the Awatere FMU following engagement round 1 feedback.

Waima/Ure River mouth

The southern part of the FMU comprises three main catchments—Blind River, Flaxbourne River, and Waima (Ure) River.

Blind River is the most northerly of the three rivers and flows in a north-easterly direction from its source in the Haldon Hills to reach the coast towards the centre of Clifford Bay. Blind River has smaller tributary streams, which are primarily situated to the south of the river. Both Blind River and its tributaries flow intermittently due to low rainfall and a lack of large aquifers to sustain flows. Because many areas dry up during the summer months, there are many earth dams within the catchment that are required to capture and retain water for crop irrigation.

Menu MARLBOROUGH DISTRICT COUNCIL Log in Do it online Contact

Freshwater Management Units

Home Environment Freshwater Management Freshwater Management Units East Coast Complex

Awatere
East Coast Complex
- FMU History and Land Use
- Historic Freshwater State
- Current Freshwater State
- Proposed Values
- Proposed Visions
- Proposed Environmental Outcomes

Marlborough Sounds Complex
Te Hoiere / Pelorus
Waiau-toa / Clarence
Wairau

Historic Freshwater State

On this page

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Surface Water Quality – WQI measures

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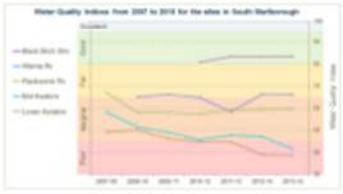
The Surface Water Quality State of the Environment (SOE) monitoring has been operational in Marlborough since 2007. The programme measures 56 sites regionally, two of which are in the East Coast Complex FMU.

The Water Quality Index (WQI) serves as a consolidated score reflecting the quality of river water. It is derived from nine chemical and physical parameters measured on a monthly basis. The WQI ranges from 0 to 100 with higher values indicating better water quality. The WQI simplifies comparisons of water quality across various waterways and serves as a valuable tool for identifying degraded waterways and prioritising improvement actions.

Overall, the two monitoring sites do not show strong fluctuations in water quality over the last two decades. The Waima River has superior water quality compared to the Flaxbourne, which is listed in the pMEP as degraded or at risk of degradation. The table and graph on this page show the historical water quality in this FMU has fluctuated but is slightly improved. Note this graph is historic; only the Waima/Ure River and Flaxbourne River are part of this FMU area.



WQI graph, South Marlborough 2007-2015

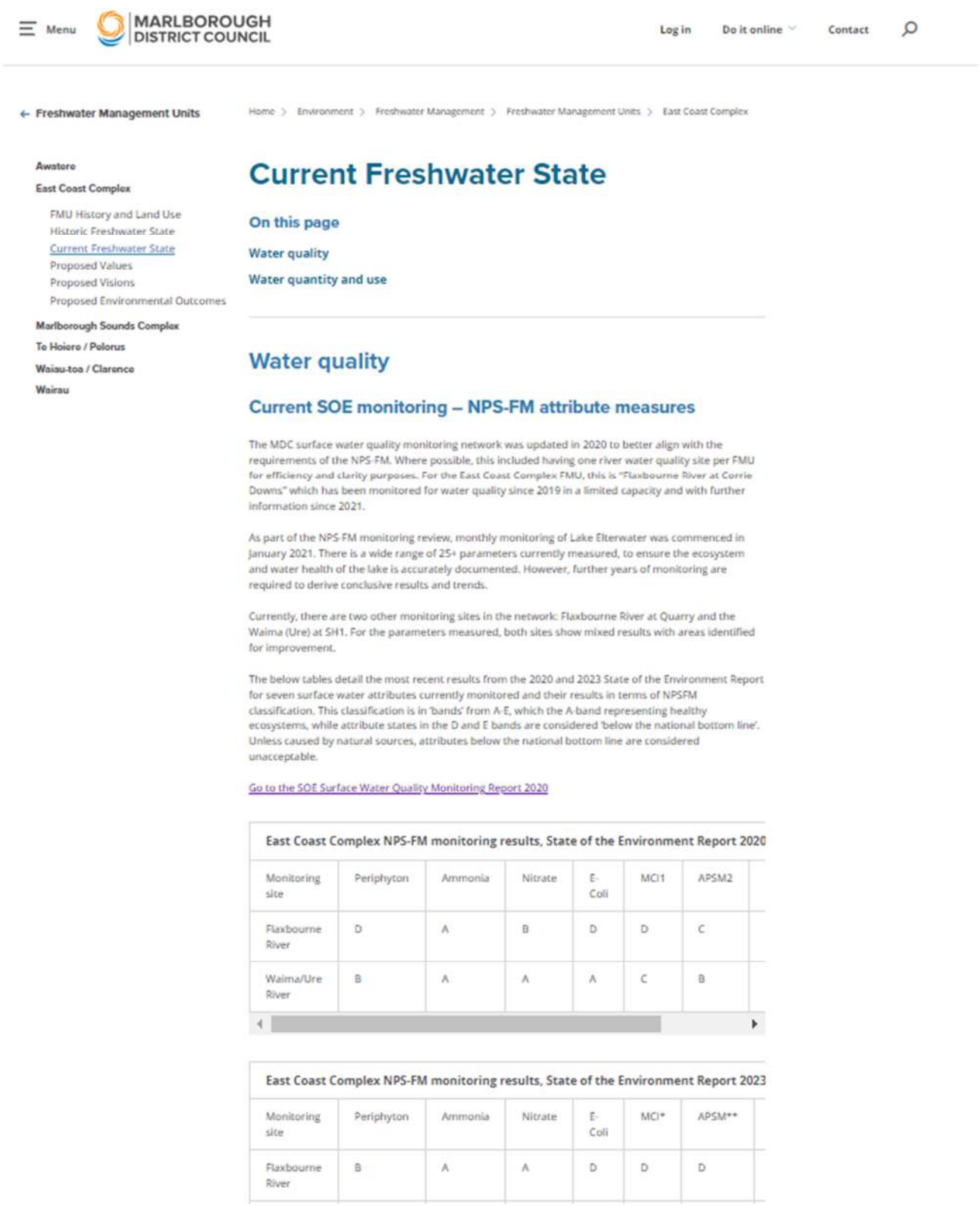
The 2016 surface water SOE report provides insight as to the sharp dip in WQI around 2011-2013 for the Waima River and a wider trend around pH and nitrogen in the waterbodies:

"A unique phenomenon for the larger rivers in [the South Marlborough] group is the occurrence of consistently elevated pH values as a result of limestone deposits in the catchments. The Waima River catchment contains the largest area of pure limestone, which manifests in the highest pH values of any river currently monitored. Subsequently, exceedances of the pH guideline account for a large part of the reduction in the Water Quality Index for this waterway. The unusually high soluble inorganic nitrogen concentrations in the Waima River, however, are not a natural phenomenon. Concentrations are often higher than in the Flaxbourne River, which has a significantly larger proportion of pasture in the catchment. It is unknown what is causing the high nitrogen concentrations with leachate from large piles of organic material or direct discharges of organic waste being only two of the possible sources. This would need to be investigated further, particularly, if the Water Quality Index for the Waima River declines into the 'marginal' category as it has done in the past."

The below table shows the historical WQI indices for the ECC FMU monitoring sites.

East Coast Complex SOE monitoring sites – historic quality measures

Monitoring	2007	2010	2011	2012	2014	2016



Menu MARLBOROUGH DISTRICT COUNCIL Log in Do it online Contact

← Freshwater Management Units

Home > Environment > Freshwater Management > Freshwater Management Units > East Coast Complex

Awatere
East Coast Complex
FMU History and Land Use
Historic Freshwater State
Current Freshwater State
Proposed Values
Proposed Visions
Proposed Environmental Outcomes
Marlborough Sounds Complex
Te Hoiere / Pelorus
Waiau-toa / Clarence
Wairau

Current Freshwater State

On this page

Water quality
Water quantity and use

Water quality

Current SOE monitoring – NPS-FM attribute measures

The MDC surface water quality monitoring network was updated in 2020 to better align with the requirements of the NPS-FM. Where possible, this included having one river water quality site per FMU for efficiency and clarity purposes. For the East Coast Complex FMU, this is "Flaxbourne River at Corrie Downs" which has been monitored for water quality since 2019 in a limited capacity and with further information since 2021.

As part of the NPS-FM monitoring review, monthly monitoring of Lake Elterwater was commenced in January 2021. There is a wide range of 25+ parameters currently measured, to ensure the ecosystem and water health of the lake is accurately documented. However, further years of monitoring are required to derive conclusive results and trends.

Currently, there are two other monitoring sites in the network: Flaxbourne River at Quarry and the Waima (Ure) at SH1. For the parameters measured, both sites show mixed results with areas identified for improvement.

The below tables detail the most recent results from the 2020 and 2023 State of the Environment Report for seven surface water attributes currently monitored and their results in terms of NPSFM classification. This classification is in 'bands' from A-E, which the A-band representing healthy ecosystems, while attribute states in the D and E bands are considered 'below the national bottom line'. Unless caused by natural sources, attributes below the national bottom line are considered unacceptable.

Go to the SOE Surface Water Quality Monitoring Report 2020

East Coast Complex NPS-FM monitoring results, State of the Environment Report 2020

Monitoring site	Periphyton	Ammonia	Nitrate	E-Coli	MCI1	APSM2
Flaxbourne River	D	A	B	D	D	C
Waima/Ure River	B	A	A	A	C	B

East Coast Complex NPS-FM monitoring results, State of the Environment Report 2023

Monitoring site	Periphyton	Ammonia	Nitrate	E-Coli	MCI*	APSM**
Flaxbourne River	B	A	A	D	D	D

Appendix 4 – New website pages, Marlborough Sounds Complex

Menu MARLBOROUGH DISTRICT COUNCIL Log in Do it online Contact

← Freshwater Management Units

Awatere
East Coast Complex
Marlborough Sounds Complex
- FMU History and Land Use
- Historic Freshwater State
- Current Freshwater State
- Proposed Values
- Proposed Visions
- Proposed Environmental Outcomes

Te Hoiere / Pelorus
Waiau-toa / Clarence
Wairau

Home > Environment > Freshwater Management > Freshwater Management Units > Marlborough Sounds Complex

FMU History and Land Use

On this page

Climate
Geology and soils
Bodies of water
Flora and fauna habitats
Land use and cover
Māori history in the area

Climate

The climate of the Marlborough Sounds is characterised by prevailing west to northwest winds with frequent gales. Rainfall is reliable with a southwest-northeast gradient, where there is a higher mean average annual rainfall of 2,000mm in the southwest that declines to 900mm in the far outer reaches of the north-eastern sounds. Summers are generally warm, and winters are mild.

Geology and soils

The geology of the Marlborough Sounds FMU is complex. The basement rocks in the west are dominated by argillite and igneous conglomerates, with some areas of ultramafic "Mineral Belt" rocks and volcanics. The centre is primarily greywacke and argillite, and the east is dominated by schists. These are arranged in belts or strips along a northeast-southwest axis.

The area is home to steep land soils that have formed from the parent rocks and include fragmented debris flows of soils downslope. Many soils are highly erodible with clay content of over 60%. Generally, the soils are moderately fertile, but in the higher rainfall areas they have been leached and are infertile. In the ultramafic (mineral belt) areas, concentrations of metallic minerals create soils that can inhibit plant growth.

Bodies of water

The regional subsidence in the Marlborough Sounds has resulted in the drowning of the original river systems, which used to flow southwards connecting with the Pelorus River at Havelock and then flowing through the Kaituna Valley to join the Wairau River. The resulting landscape is dominated by steep to very steep hill and mountain slopes, sea cliffs, rocky shorelines, and islands.

Graham River

There are many unnamed streams and creeks in the FMU, and the largest catchments are in the south. The exception is Kenepuru Stream, which is located more centrally, rising on the southern side of Mount Stokes. The Kenepuru catchment is not typical of the Marlborough Sounds as the river meanders over a wide alluvial floodplain for much of its length. The river is steeply incised in some places, and during the summer months the lower sections can run dry. Over half the catchment is in native bush and scrub with pastoral farming on the lower slopes and valley.

The most easterly of the larger river catchments is Linkwater, which is a low-lying alluvial plain of around 5 kilometres in length. It separates the head of Queen Charlotte Sound/Totaranui and the Mahakipawa

← Freshwater Management Units

Awatere
East Coast Complex
Marlborough Sounds Complex
FMU History and Land Use
Historic Freshwater State
Current Freshwater State
Proposed Values
Proposed Visions
Proposed Environmental Outcomes
Te Hoiere / Pelorus
Waiau-toa / Clarence
Wairau

Home > Environment > Freshwater Management > Freshwater Management Units > Marlborough Sounds Complex

Historic Freshwater State

On this page

Water quality

Surface Water Quality – WQI measures

Surface water, being above ground waterways, are easily recognizable across the Marlborough landscape - such as our iconic braided rivers. Surface water courses gain their flow through catchment areas as well as underground springs in some cases. A catchment is the area of land from which all rainfall and streams flows out into a river, a lake or the sea. The catchment of large rivers can be divided into smaller sub-catchments, which usually represent the tributaries.

The Surface Water Quality State of the Environment (SOE) monitoring has been operational in Marlborough since 2007. The programme measures 56 sites regionally, five of which are in the Marlborough Sounds Complex (MSC) FMU.

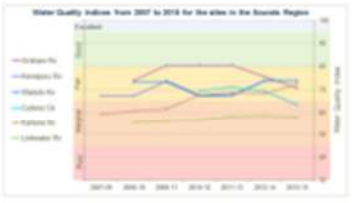
The Water Quality Index (WQI) serves as a consolidated score reflecting the quality of river water. It is derived from nine chemical and physical parameters measured on a monthly basis. The WQI ranges from 0 to 100 with higher values indicating better water quality. The WQI simplifies comparisons of water quality across various waterways and serves as a valuable tool for identifying degraded waterways and prioritising improvement actions.

The five index classes represent water quality, with "marginal" and "poor" categories requiring improvement. The higher the index number, the better the water quality and accordingly the closer to "excellent" WQI rating. Read more about our surface water SOE monitoring programme below:

Go to our SOE monitoring programme page

The below table shows the historical WQI indices for the Marlborough Sounds Complex FMU monitoring sites. This data is also shown on the graph below - please note this graph is historic; the Kaituna River is not part of this FMU area. The WQI for the Graham, Kenepuru, Waitohi, and Linkwater Rivers and Cullens Creek monitoring sites are summarised into the below chart.

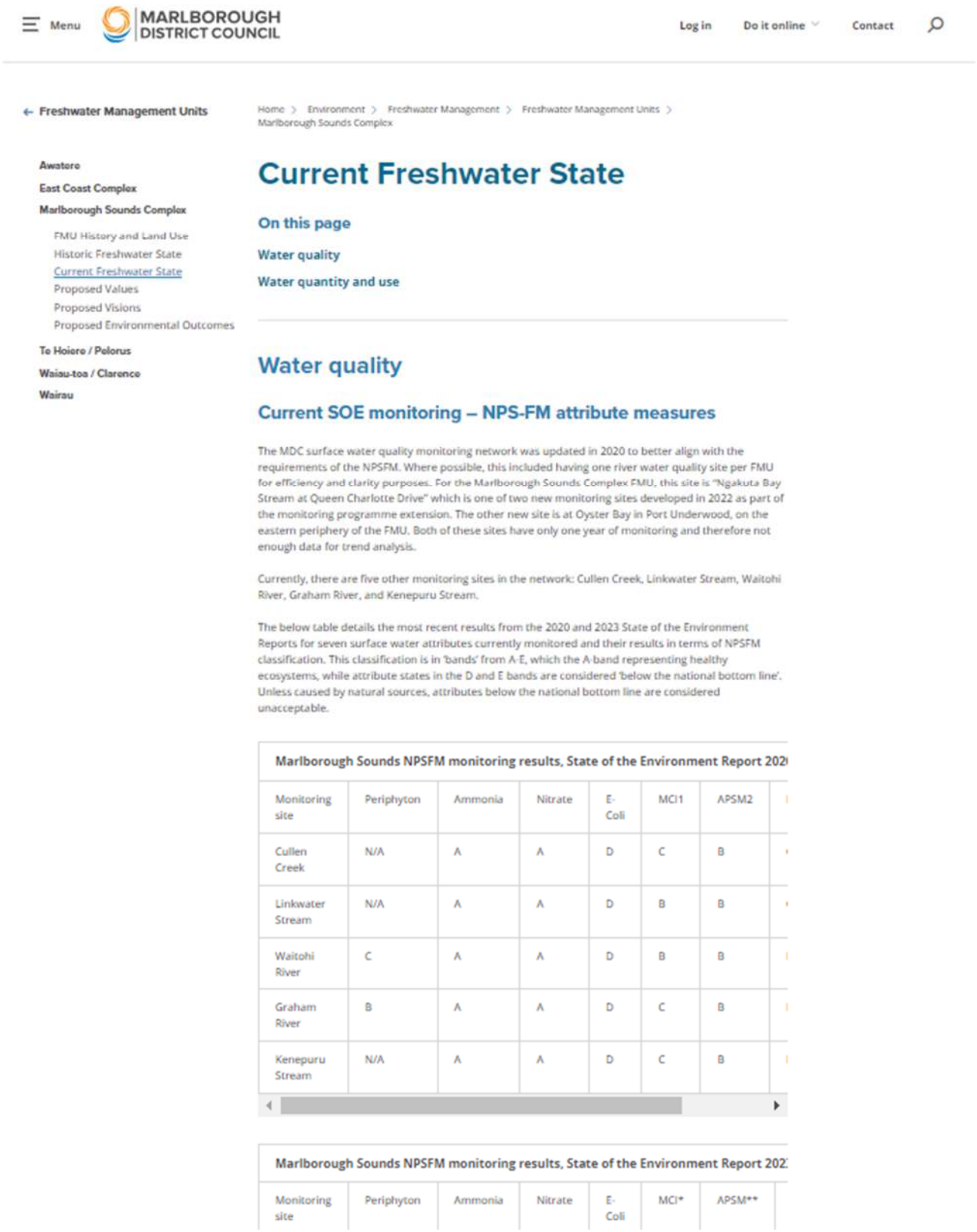
We can see from the graph that the WQI for several of the monitoring sites has fluctuated but remained within the same index band. In contrast, the Graham River and Cullens Creek WQI indices gradually declined in the early to mid-2010s. We can also see from the below chart that a large proportion of the indices were in the 'marginal' or 'poor' categories.



WQI graph, Marlborough Sounds 2007-2015

The 2016 surface water SOE report provides insight as to the decline in water quality at the Graham River and Cullens Creek monitoring sites at this time:

> *"The Graham River has the second largest proportion of native vegetation in the catchment and was originally chosen as a reference site for the other smaller catchments in this group. The Water Quality Index had been in the 'good' category between 2009 and 2013, confirming the reference status. However, in the last two years the water quality has deteriorated and has now reached the lowest value since monitoring began in late 2007. The main cause for the reduction in the Water Quality Index is a significant*



Menu MARLBOROUGH DISTRICT COUNCIL Log in Do it online Contact

← Freshwater Management Units

Awatere
East Coast Complex
Marlborough Sounds Complex
FMU History and Land Use
Historic Freshwater State
Current Freshwater State
Proposed Values
Proposed Visions
Proposed Environmental Outcomes
Te Hoiere / Pelorus
Waiau-toa / Clarence
Wairau

Home > Environment > Freshwater Management > Freshwater Management Units > Marlborough Sounds Complex

Current Freshwater State

On this page

Water quality
Water quantity and use

Water quality

Current SOE monitoring – NPS-FM attribute measures

The MDC surface water quality monitoring network was updated in 2020 to better align with the requirements of the NPSFM. Where possible, this included having one river water quality site per FMU for efficiency and clarity purposes. For the Marlborough Sounds Complex FMU, this site is "Ngakuta Bay Stream at Queen Charlotte Drive" which is one of two new monitoring sites developed in 2022 as part of the monitoring programme extension. The other new site is at Oyster Bay in Port Underwood, on the eastern periphery of the FMU. Both of these sites have only one year of monitoring and therefore not enough data for trend analysis.

Currently, there are five other monitoring sites in the network: Cullen Creek, Linkwater Stream, Waitohi River, Graham River, and Kenepuru Stream.

The below table details the most recent results from the 2020 and 2023 State of the Environment Reports for seven surface water attributes currently monitored and their results in terms of NPSFM classification. This classification is in 'bands' from A-E, which the A-band representing healthy ecosystems, while attribute states in the D and E bands are considered 'below the national bottom line'. Unless caused by natural sources, attributes below the national bottom line are considered unacceptable.

Marlborough Sounds NPSFM monitoring results, State of the Environment Report 202

Monitoring site	Periphyton	Ammonia	Nitrate	E-Coli	MCI1	APSM2
Cullen Creek	N/A	A	A	D	C	B
Linkwater Stream	N/A	A	A	D	B	B
Waitohi River	C	A	A	D	B	B
Graham River	B	A	A	D	C	B
Kenepuru Stream	N/A	A	A	D	C	B

Marlborough Sounds NPSFM monitoring results, State of the Environment Report 202

Monitoring site	Periphyton	Ammonia	Nitrate	E-Coli	MCI*	APSM**

Appendix 5 – New website pages, Te Hoiere/Pelorus FMU

Menu MARLBOROUGH DISTRICT COUNCIL Log in Do it online Contact

← Freshwater Management Units

Home > Environment > Freshwater Management > Freshwater Management Units > Te Hoiere / Pelorus

- Awatere
- East Coast Complex
- Marlborough Sounds Complex
- Te Hoiere / Pelorus
  - FMU History and Land Use
  - Historic Freshwater State
  - Current Freshwater State
  - Proposed Values
  - Proposed Visions
  - Proposed Environmental Outcomes
- Waiau-toa / Clarence
- Wairau

FMU History and Land Use

On this page

Climate

The climate of the Te Hoiere/Pelorus FMU is characterised by the highest annual rainfall in Marlborough, with annual rainfall across the FMU having been recorded as high as 2,650mm. Winters are generally cold and wet in the valleys with frosts, though the hills are warmer, while summer months are warmer but often still wet. The mean annual rainfall for the Te Hoiere/Pelorus FMU is 1,500 to 2,700mm and average monthly temperatures can range from below 5oC to above 20oC.

Geology and soils

Tectonic activity in the wider Marlborough Sounds area has had a significant influence on the Te Hoiere/Pelorus area. Tectonic tilting northwards of the Wairau Fault resulted in the uplifting of the Richmond Ranges and regional subsidence in the Marlborough Sounds area. For the Te Hoiere/Pelorus FMU, the consequence of the tilting has been the reversal of ancient river drainage patterns with the present-day Te Hoiere/Pelorus and Kaituna Rivers originally being tributaries of the Wairau River.

Roi River is a major tributary of the Te Hoiere / Pelorus River

The Richmond and Bryant Ranges are comprised of greywacke and schist with argillite basement rocks, with greywacke in the valleys which has been overlain by alluvial sediments. These formed as outwash glacial terrace surfaces, which were subsequently excavated in the warmer Post Glacial period and have formed the modern-day floodplain system. These soils are highly erodible, with clay content up to 60 percent.Tectonic activity in the wider Marlborough Sounds area has had a significant influence on the Te Hoiere/Pelorus area. Tectonic tilting northwards of the Wairau Fault resulted in the uplifting of the Richmond Ranges and regional subsidence in the Marlborough Sounds area. For the Te Hoiere/Pelorus FMU, the consequence of the tilting has been the reversal of ancient river drainage patterns with the present-day Te Hoiere/Pelorus and Kaituna Rivers originally being tributaries of the Wairau River.

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Menu MARLBOROUGH DISTRICT COUNCIL Log in Do it online Contact

← Freshwater Management Units

Home > Environment > Freshwater Management > Freshwater Management Units > Te Hoiere / Pelorus

- Awatere
- East Coast Complex
- Marlborough Sounds Complex
- Te Hoiere / Pelorus
  - FMU History and Land Use
  - Historic Freshwater State
  - Current Freshwater State
  - Proposed Values
  - Proposed Visions
  - Proposed Environmental Outcomes
- Waiau-toa / Clarence
- Wairau

Historic Freshwater State

On this page

Water quality

Surface Water Quality – WQI measures

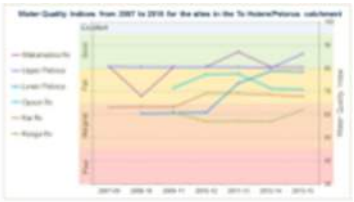
Surface water, being above ground waterways, are easily recognizable across the Marlborough landscape – such as our iconic braided rivers. Surface water courses gain their flow through catchment areas as well as underground springs in some cases. A catchment is the area of land from which all rainfall and streams flows out into a river, a lake or the sea. The catchment of large rivers, such as the Te Hoiere/Pelorus River, can be divided into smaller sub-catchments, which usually represent the tributaries.

The Surface Water Quality State of the Environment (SOE) monitoring has been operational in Marlborough since 2007. The programme measures 56 sites regionally, six of which are in the Te Hoiere/Pelorus FMU.

The Water Quality Index (WQI) serves as a consolidated score reflecting the quality of river water. It is derived from nine chemical and physical parameters measured on a monthly basis. The WQI ranges from 0 to 100 with higher values indicating better water quality. The WQI simplifies comparisons of water quality across various waterways and serves as a valuable tool for identifying degraded waterways and prioritising improvement actions.

The five index classes represent water quality, with "marginal" and "poor" categories requiring improvement. The higher the index number, the better the water quality and accordingly the closer to "excellent" WQI rating. Read more about our surface water SOE monitoring programme below:

Go to the SOE monitoring reporting page

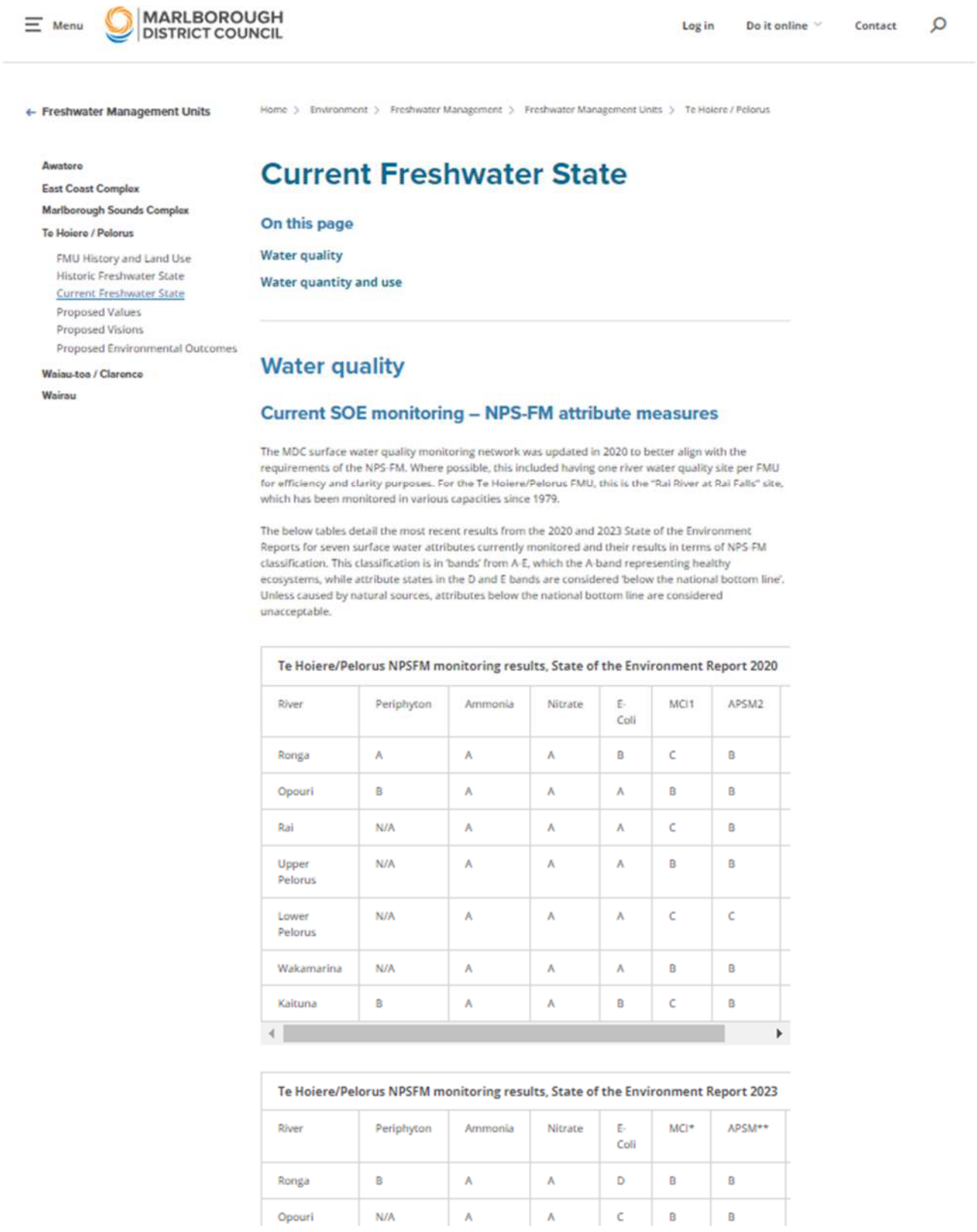


WQI graph, Te Hoiere/Pelorus 2007-2015

The below table shows the historical WQI indices for the Te Hoiere/Pelorus FMU monitoring sites. This data is also shown on the graph right and summarised into the table and chart below, which show the water quality in this FMU generally fluctuated but also improved across many of the sites from 2007-2018.

Te Hoiere/Pelorus WQI 2008-2018

Monitoring site	2007-2009	2010-2012	2011-2013	2012-2014	2014-2016	201 201
Ronga River	Not measured	Marginal	Marginal	Marginal	Marginal	Fair
Opouri River	Fair	Fair	Fair	Fair	Fair	Goo
Rai River	Marginal	Fair	Fair	Fair	Fair	Goo



Menu MARLBOROUGH DISTRICT COUNCIL Log in Do it online Contact

← Freshwater Management Units

Home > Environment > Freshwater Management > Freshwater Management Units > Te Hoiere / Pelorus

- Awatere
- East Coast Complex
- Marlborough Sounds Complex
- Te Hoiere / Pelorus
  - FMU History and Land Use
  - Historic Freshwater State
  - Current Freshwater State
  - Proposed Values
  - Proposed Visions
  - Proposed Environmental Outcomes
- Waiau-toa / Clarence
- Wairau

Current Freshwater State

On this page

Water quality

Water quantity and use

Water quality

Current SOE monitoring – NPS-FM attribute measures

The MDC surface water quality monitoring network was updated in 2020 to better align with the requirements of the NPS-FM. Where possible, this included having one river water quality site per FMU for efficiency and clarity purposes. For the Te Hoiere/Pelorus FMU, this is the "Rai River at Rai Falls" site, which has been monitored in various capacities since 1979.

The below tables detail the most recent results from the 2020 and 2023 State of the Environment Reports for seven surface water attributes currently monitored and their results in terms of NPS-FM classification. This classification is in 'bands' from A-E, which the A-band representing healthy ecosystems, while attribute states in the D and E bands are considered 'below the national bottom line'. Unless caused by natural sources, attributes below the national bottom line are considered unacceptable.

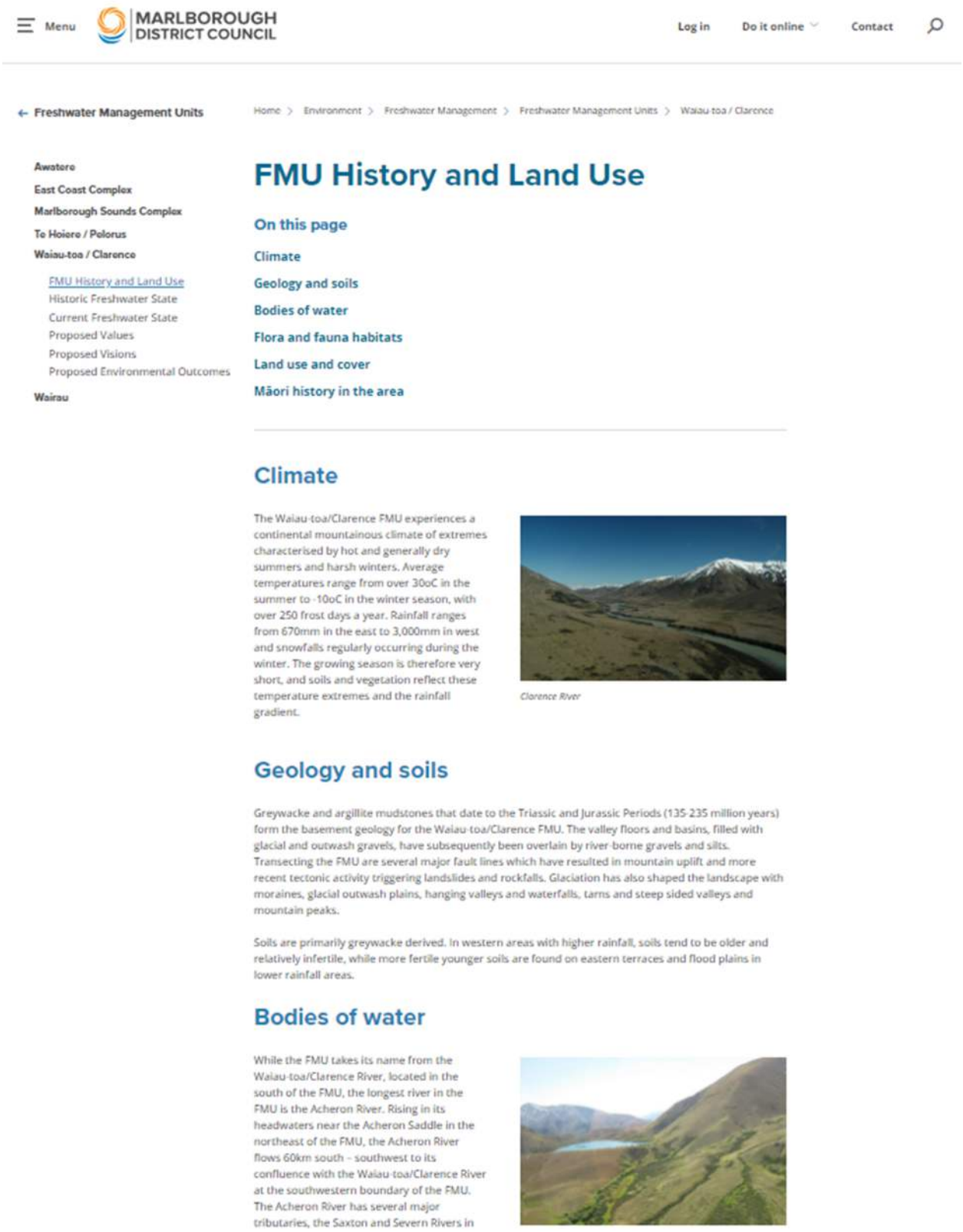
Te Hoiere/Pelorus NPSFM monitoring results, State of the Environment Report 2020

River	Periphyton	Ammonia	Nitrate	E-Coli	MCI1	APSM2
Ronga	A	A	A	B	C	B
Opouri	B	A	A	A	B	B
Rai	N/A	A	A	A	C	B
Upper Pelorus	N/A	A	A	A	B	B
Lower Pelorus	N/A	A	A	A	C	C
Wakamarina	N/A	A	A	A	B	B
Kaituna	B	A	A	B	C	B

Te Hoiere/Pelorus NPSFM monitoring results, State of the Environment Report 2023

River	Periphyton	Ammonia	Nitrate	E-Coli	MCI*	APSM**
Ronga	B	A	A	D	B	B
Opouri	N/A	A	A	C	B	B

Appendix 6 – New website pages, Waiau-toa/Clarence FMU



Menu MARLBOROUGH DISTRICT COUNCIL Log in Do it online Contact

← Freshwater Management Units

Home > Environment > Freshwater Management > Freshwater Management Units > Waiau-toa / Clarence

Awatere
East Coast Complex
Marlborough Sounds Complex
Te Hoiere / Pelorus
Waiau-toa / Clarence
FMU History and Land Use
Historic Freshwater State
Current Freshwater State
Proposed Values
Proposed Visions
Proposed Environmental Outcomes
Wairau

FMU History and Land Use

On this page

Climate
Geology and soils
Bodies of water
Flora and fauna habitats
Land use and cover
Māori history in the area

Climate

The Waiau-toa/Clarence FMU experiences a continental mountainous climate of extremes characterised by hot and generally dry summers and harsh winters. Average temperatures range from over 30oC in the summer to -10oC in the winter season, with over 250 frost days a year. Rainfall ranges from 670mm in the east to 3,000mm in west and snowfalls regularly occurring during the winter. The growing season is therefore very short, and soils and vegetation reflect these temperature extremes and the rainfall gradient.

Clarence River

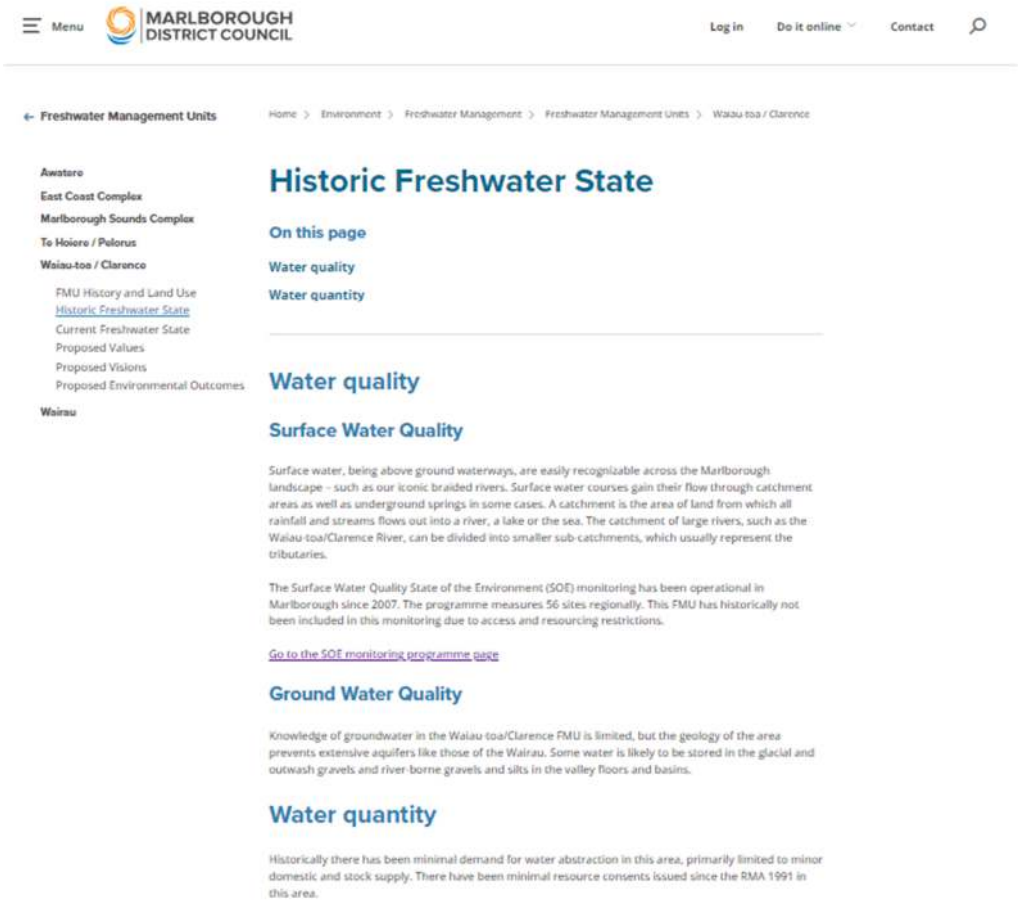
Geology and soils

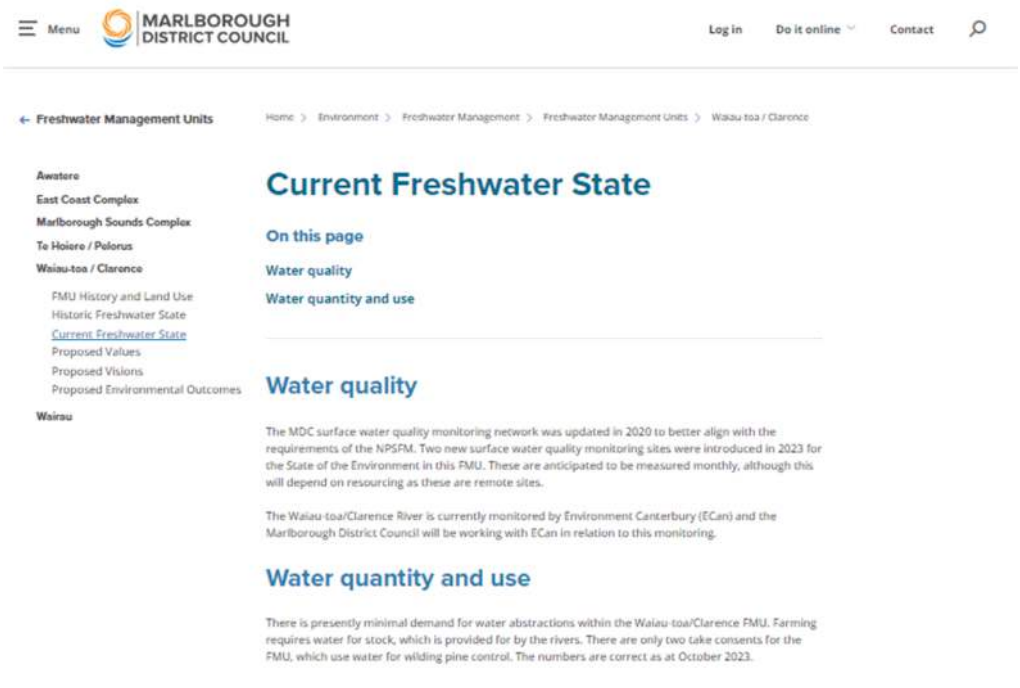
Greywacke and argillite mudstones that date to the Triassic and Jurassic Periods (135-235 million years) form the basement geology for the Waiau-toa/Clarence FMU. The valley floors and basins, filled with glacial and outwash gravels, have subsequently been overlain by river-borne gravels and silts. Transecting the FMU are several major fault lines which have resulted in mountain uplift and more recent tectonic activity triggering landslides and rockfalls. Glaciation has also shaped the landscape with moraines, glacial outwash plains, hanging valleys and waterfalls, tarns and steep sided valleys and mountain peaks.

Soils are primarily greywacke derived. In western areas with higher rainfall, soils tend to be older and relatively infertile, while more fertile younger soils are found on eastern terraces and flood plains in lower rainfall areas.

Bodies of water

While the FMU takes its name from the Waiau-toa/Clarence River, located in the south of the FMU, the longest river in the FMU is the Acheron River. Rising in its headwaters near the Acheron Saddle in the northeast of the FMU, the Acheron River flows 60km south - southwest to its confluence with the Waiau-toa/Clarence River at the southwestern boundary of the FMU. The Acheron River has several major tributaries, the Saxton and Severn Rivers in


Menu
MARLBOROUGH DISTRICT COUNCIL
Log in
Do it online
Contact
Freshwater Management Units
Home > Environment > Freshwater Management > Freshwater Management Units > Waiau-toa / Clarence
Awatere
East Coast Complex
Marlborough Sounds Complex
Te Hoiere / Pelorus
Waiau-toa / Clarence
FMU History and Land Use
Historic Freshwater State
Current Freshwater State
Proposed Values
Proposed Visions
Proposed Environmental Outcomes
Wairau
Historic Freshwater State
On this page
Water quality
Water quantity
Water quality
Surface Water Quality
Surface water, being above ground waterways, are easily recognizable across the Marlborough landscape - such as our iconic braided rivers. Surface water courses gain their flow through catchment areas as well as underground springs in some cases. A catchment is the area of land from which all rainfall and streams flows out into a river, a lake or the sea. The catchment of large rivers, such as the Waiau-toa/Clarence River, can be divided into smaller sub-catchments, which usually represent the tributaries.
The Surface Water Quality State of the Environment (SOE) monitoring has been operational in Marlborough since 2007. The programme measures 56 sites regionally. This FMU has historically not been included in this monitoring due to access and resourcing restrictions.
Go to the SOE monitoring programme page
Ground Water Quality
Knowledge of groundwater in the Waiau-toa/Clarence FMU is limited, but the geology of the area prevents extensive aquifers like those of the Wairau. Some water is likely to be stored in the glacial and outwash gravels and river-borne gravels and silts in the valley floors and basins.
Water quantity
Historically there has been minimal demand for water abstraction in this area, primarily limited to minor domestic and stock supply. There have been minimal resource consents issued since the RMA 1991 in this area.


Menu
MARLBOROUGH DISTRICT COUNCIL
Log in
Do it online
Contact
Freshwater Management Units
Home > Environment > Freshwater Management > Freshwater Management Units > Waiau-toa / Clarence
Awatere
East Coast Complex
Marlborough Sounds Complex
Te Hoiere / Pelorus
Waiau-toa / Clarence
FMU History and Land Use
Historic Freshwater State
Current Freshwater State
Proposed Values
Proposed Visions
Proposed Environmental Outcomes
Wairau
Current Freshwater State
On this page
Water quality
Water quantity and use
Water quality
The MDC surface water quality monitoring network was updated in 2020 to better align with the requirements of the NPSFM. Two new surface water quality monitoring sites were introduced in 2023 for the State of the Environment in this FMU. These are anticipated to be measured monthly, although this will depend on resourcing as these are remote sites.
The Waiau-toa/Clarence River is currently monitored by Environment Canterbury (ECan) and the Marlborough District Council will be working with ECan in relation to this monitoring.
Water quantity and use
There is presently minimal demand for water abstractions within the Waiau-toa/Clarence FMU. Farming requires water for stock, which is provided for by the rivers. There are only two take consents for the FMU, which use water for wilding pine control. The numbers are correct as at October 2023.

Appendix 7 – New website pages, Wairau FMU

Menu MARLBOROUGH DISTRICT COUNCIL Log in Do it online Contact

← Freshwater Management Units

Home > Environment > Freshwater Management > Freshwater Management Units > Wairau

Awatere
East Coast Complex
Marlborough Sounds Complex
Te Hoiere / Pelorus
Waiau-toa / Clarence
Wairau

FMU History and Land Use
Historic Freshwater State
Current Freshwater State
Proposed Values
Proposed Visions
Proposed Environmental Outcomes

FMU History and Land Use

On this page

Climate
Geology and soils
Bodies of water
Flora and fauna habitats
Land use and cover
Māori history in the area

Climate

The climate of the Wairau FMU is characterised by a wet climate for those tributaries located on the north bank of the Wairau Valley, while the south bank tributary catchments have a dry climate. There is also a distinct west to east rainfall gradient from the mountainous western upper catchment which can experience high mean annual rainfalls from 1,500 to 2,500mm, down to the east coast where mean annual rainfall can be as little as 650mm. Summers in Blenheim are warm and dry; while winters are generally sunny, frosts are common. Inland temperatures are generally several degrees cooler and the number of frost days increases.

Geology and soils

Tectonic activity has had a major influence on the geology of the Wairau. Northwest tilting of land between the Wairau and Awatere faults has resulted in the main tributaries of the Wairau River being on the southern side of the Wairau Valley. Most of the geology in the catchment is greywacke and argillite with the lower reaches having extensive alluvial deposits laid down by the Wairau River and its tributaries from erosion of the inland mountain ranges during glacial periods. To the south-eastern side of the FMU are the Wither and Redwood Hills which were also formed from tectonic movements consisting of underlying gravel conglomerates topped by extensive wind-blown Wairau loess greywacke, which is highly erodible.

Soils on the Wairau Plain reflect this geological history with loess and more developed soils on the older alluvium terraces, with less well-developed soils on the younger redeposited terraces. The lower valley also contains organic floodplain deposits. To the east of State Highway 1, the soils occur on geologically recent sand dunes, gravel beach ridges, alluvium, and saline estuarine deposits.

Bodies of water

The Wairau River is some 170 kilometres long, rising in the Spenser Mountains to the south of St Arnaud at a height of over 2,000 metres. Initially, the river flows north for around 50 kilometres before flowing northeast along the Wairau Fault for the remainder of its length and reaching the sea at Cloudy Bay on the edge of the Cook Strait. In its upper reaches, it is confined in a gorge with rapids. As the valley widens, the river becomes increasingly braided in its middle reaches. These middle reaches of the Wairau are known to be of importance for the recharge of the Wairau Aquifer and are the subject of a five-year study into braided rivers being undertaken by several councils and Lincoln Agritech.

Upper Wairau River

Menu MARLBOROUGH DISTRICT COUNCIL Log in Do it online Contact

← Freshwater Management Units

Home > Environment > Freshwater Management > Freshwater Management Units > Wairau

Awatere
East Coast Complex
Marlborough Sounds Complex
Te Hoiere / Pelorus
Waiau-toa / Clarence
Wairau

FMU History and Land Use
Historic Freshwater State
Current Freshwater State
Proposed Values
Proposed Visions
Proposed Environmental Outcomes

Historic Freshwater State

On this page

Water quality

Surface Water Quality – WQI measures

Surface water, being above ground waterways, are easily recognizable across the Marlborough landscape - such as our iconic braided rivers. Surface water courses gain their flow through catchment areas as well as underground springs in some cases. A catchment is the area of land from which all rainfall and streams flows out into a river, a lake or the sea. The catchment of large rivers, such as the Wairau River, can be divided into smaller sub-catchments, which usually represent the tributaries.

Groundwater and aquifers are an important part of the Marlborough hydrological process. The 2011 book "Groundwaters of Marlborough", published by MDC is a compilation of extensive research into the community knowledge of groundwater resources at the time. With a focus on aquifer science and hydrology, this was an update on the 1988 version which was similarly extensive and part of a series dedicated to underground water. The book continues to be a valuable resource and is available in full on the this website:

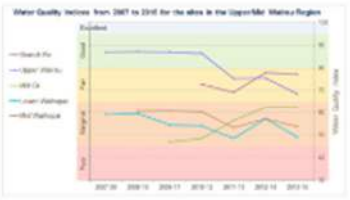
Go to the Reports and Special Investigations page

Surface Water Quality

Surface water, being above ground waterways, are easily recognizable across the Marlborough landscape - such as our iconic braided rivers. Surface water courses gain their flow through catchment areas as well as underground springs in some cases. A catchment is the area of land from which all rainfall and streams flows out into a river, a lake or the sea. The catchment of large rivers, such as the Wairau, can be divided into smaller sub-catchments, which usually represent the tributaries.

The Surface Water Quality State of the Environment (SOE) monitoring has been operational in Marlborough since 2007. The programme measures 56 sites regionally, 17 of which are in the Wairau FMU.

The Water Quality Index (WQI) serves as a consolidated score reflecting the quality of river water. It is derived from nine chemical and physical parameters measured on a monthly basis. The WQI ranges from 0 to 100 with higher values indicating better water quality. The WQI simplifies comparisons of water quality across various waterways and serves as a valuable tool for identifying degraded waterways and prioritising improvement actions.



The five index classes represent water quality, with "marginal" and "poor" categories requiring improvement. The higher the index number, the better the water quality and accordingly the closer to "excellent" WQI rating. Read more about our SOE monitoring programme below:

← Freshwater Management Units

Home > Environment > Freshwater Management > Freshwater Management Units > Wairau

Awatere
East Coast Complex
Marlborough Sounds Complex
Te Hoiere / Pelorus
Waiau-toa / Clarence
Wairau
FMU History and Land Use
Historic Freshwater State
Current Freshwater State
Proposed Values
Proposed Visions
Proposed Environmental Outcomes

Current Freshwater State

On this page

Water quality

Current SOE monitoring – NPS-FM attribute measures

The MDC surface water quality monitoring network was updated in 2020 to better align with the requirements of the NPS-FM. Where possible, this included having one river water quality site per FMU for efficiency and clarity purposes. For the Wairau FMU, this site is "Wairau River at Tuamarina" which has been monitored since the mid-1990s.

The below table details the most recent results from the 2020 and 2023 State of the Environment Reports for seven surface water attributes currently monitored and their results in terms of NPS-FM classification. This classification is in 'bands' from A-E, which the A-band representing healthy ecosystems, while attribute states in the D and E bands are considered 'below the national bottom line'. Unless caused by natural sources, attributes below the national bottom line are considered unacceptable. It is noted that there are no D or E bands in this FMU. Currently, there are 16 other monitoring sites in the network.

Wairau FMU 2020 SOE report NPS-FM monitoring results

Site	Periphyton	Ammonia	Nitrate	E-Coli	MCI1	APSM2
Upper Wairau	N/A	A	A	A	B	B
Goulter River	N/A	A	A	A	A	A
Branch River	N/A	A	A	A	B	B
Mill Creek	N/A	A	B	D	C	B
Mid Waihopai	N/A	A	A	B	C	B
Lower Waihopai	N/A	A	A	B	C	B
Ohinemahuta River	A	A	A	B	B	B
Are Are Creek	B	A	A	D	C	B
Lower Wairau	N/A	A	A	A	D	C
Tuamarina River	N/A	A	A	A	D	D
Omaka River	C	A	A	A	C	B