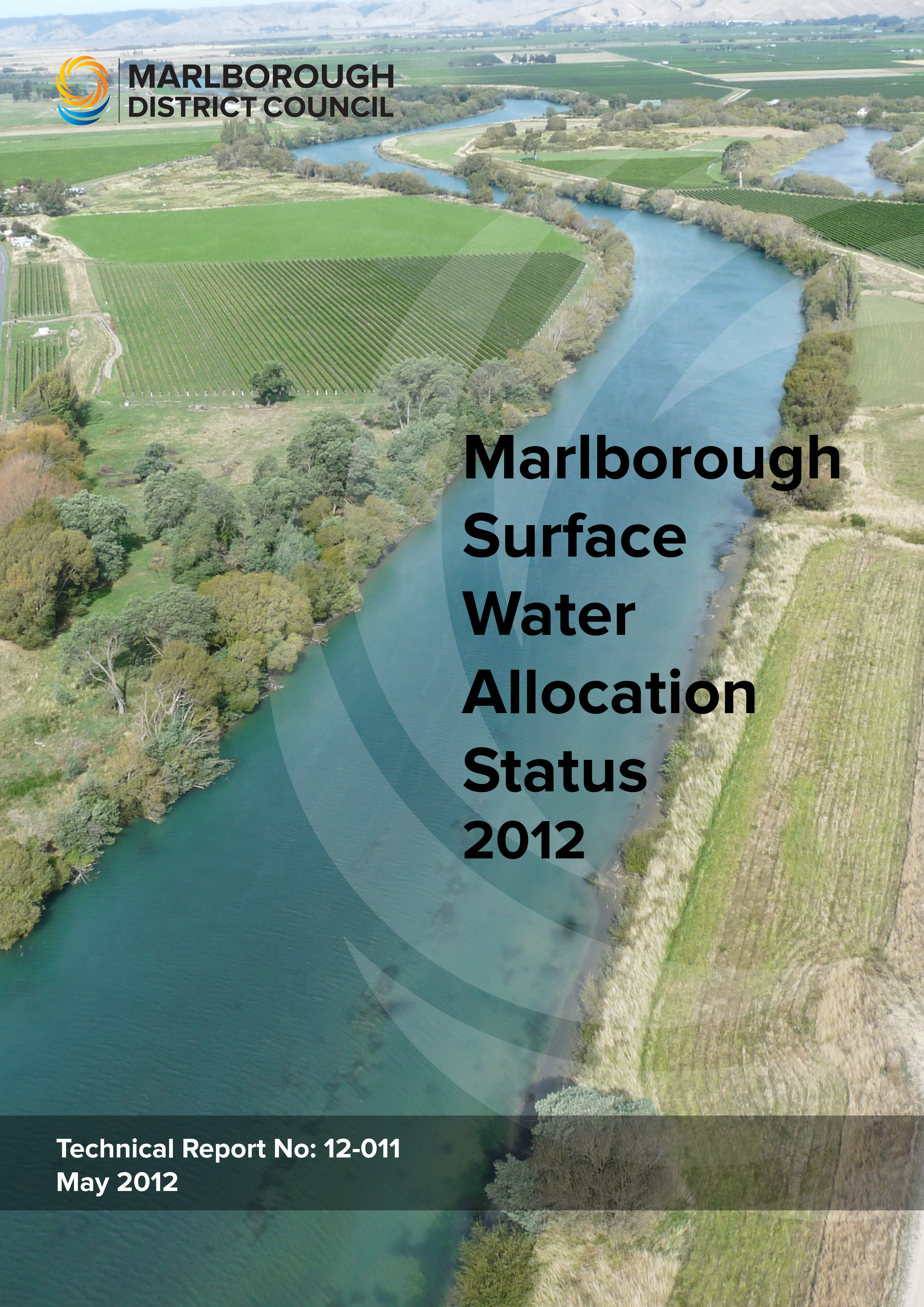

MARLBOROUGH DISTRICT COUNCIL

Marlborough Surface Water Allocation Status 2012

Technical Report No: 12-011
May 2012

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Executive Summary

Surface water is an instantaneous resource, here today, and gone tomorrow. For most of the year there is sufficient water available in Marlborough for all reasonable requirements. However parts of Marlborough are seasonally water short. Balancing peak water demands on both a spatial and temporal basis is necessary for continued economic growth.

The greater majority of surface water allocation in the Wairau Awatere Resource Management Plan area comes from the three major water resources which have defined Sustainable Flow Regimes under the plan. However there are many smaller rivers and streams which do not have any specific environmental protection under the plan, so consents have to be determined on a case by case basis. This places those resources at risk from ad hoc decision making.

The multi class allocation system included in the Wairau Awatere Resource Management Plan enables large volumes of water to be taken from the three major rivers which are the main source of irrigation water in the District. However it has to be recognised that there are reliability issues with the lower classes of water. Class C is of limited reliability, and is intended only for takes to storage for use during summer. Even class B may be considered to be not sufficiently reliable for major investments without a storage component.

With the exception of the three rivers mentioned above, rivers and streams in the Wairau Awatere Resource Management Plan area have no allocation limits, and are at risk of over allocation through the resource consent process.

The Marlborough Sounds Resource Management Plan has more comprehensive water rules, which provide more protection for environmental requirements. However the allocation limits in this plan area are more restrictive, and may be limiting development in some areas.

"Marlborough is not water short,

it's just not in the right place at the right time"

Contents

1. Purpose of Report

This report is intended to detail the current allocation status of Marlborough's surface water resources, including discussion on the current water allocation rules in the two Resource Management Plans operative in the region, the efficiency and effectiveness of the rules, and the ability to access water, while protecting the environment.

2. Background

A review of the Regional Policy Statement and the two Resource Management Plans operative in the region is being undertaken by the Council. Water is a major component of those plans, with much of Marlborough's economic growth in recent years being dependent on irrigated agriculture.

3. Overview of Marlborough District

Marlborough is a hydrologically and climatically diverse region covering about 10,500 km^2. Rainfall varies from around 600 mm per year in east coast areas, to over 2500 mm in some parts of northern Marlborough. The climate and soils of the lower valleys are suited to a variety of crops, and in recent decades the success of Marlborough wine has seen large areas of pastoral and horticultural land converted to viticulture. Some coastal areas are seasonally water short, due mainly to extremely high evapo-transpiration rates, and access to reliable water has been a challenge. Further inland the high mountain ranges receive good rainfall, providing good base flow for the major rivers which supply water to most of the irrigated areas. A map showing the median rainfall figures for the Marlborough District is shown at Appendix 1.

4. Surface Water Resource Areas

For the purpose of this report, the region has been split into areas which have similar hydrology and common approaches to surface water allocation. In general each of these areas comprises a number of the water resource units detailed in the water quality and ecological reports. These areas have been grouped into four headings, according to general location as follows;

Marlborough Sounds Resource Management Plan area

- Pelorus and Kaituna Rivers, and their tributaries.
- Other Marlborough Sounds streams

Wairau River main stem reaches

- Lower Wairau River, and Wairau Diversion below SH1 (tidal reaches)
- Wairau River main stem from SH1 to Waihopai confluence
- Wairau River main stem from Waihopai confluence to Branch confluence

Wairau tributaries

- Wairau Plain and Southern Valleys catchments including Omaka River
- Waihopai River
- Wairau south bank tributaries from Bankhouse Stream to Saltwater Creek
- Branch River catchment
- Upper Wairau River catchment above Branch confluence
- Wairau River Northbank tributaries from coast to Goulter River

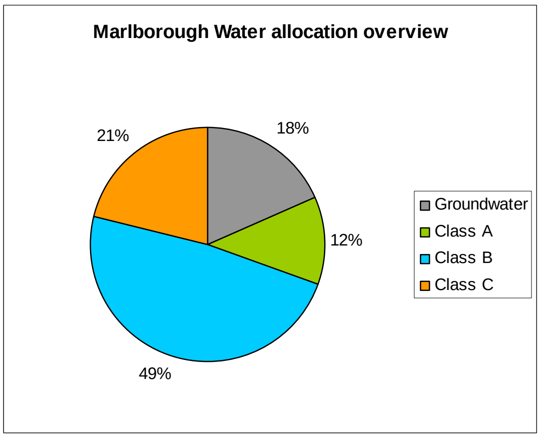
Southern Marlborough catchments

- Awatere River catchment
- East Coast streams, including Blind River, Flaxbourne River, and Waima (Ure) River
- Clarence and Acheron Rivers

These areas are illustrated in Appendix 2.

5. Water Allocation – Overview

Approximately 21 m^3/s of water has been allocated to consumptive uses in the Marlborough District (i.e. excluding Hydro-Electric Power allocations. Of this over 80% is from surface water sources, with a mix of class A, class B, and class C water as shown below (the class allocation system will be discussed in a later section).



Water is allocated under the provisions of the two Resource Management plans which cover the district, the Wairau Awatere Resource Management Plan (WARMP), and the Marlborough Sounds Resource Management Plan (MSRMP). Having two plans means that there are some differences between the rules relating to water allocations in the two plan areas. However despite this, there are also commonalities between the two areas. The following section discusses this further.

5.1. Sustainable Flow Regimes

Sustainable Flow Regimes (SFRs) are minimum flows set to protect the instream habitat and/or recreational values of a river or stream. They are also sometimes referred to as Environmental or Ecological Flows (EF). The SFR takes precedence over any allocation of water, and the setting of an appropriate SFR is essential before any allocation regime is derived.

The setting of a SFR needs to consider the recreational, environmental, and economic values of the water body, and should be done in conjunction with all stake holders. This is an environmental planning exercise which may require complex scientific analysis, depending on the values of the river, and the degree of competition for the resource.

While a SFR is usually a minimum flow regardless of season, there may be reasons for having a variable SFR, such as allowing additional habitat at important times of the year. A recent example for this is the variable minimum residual flow set by the TrustPower hearing process for the reach of river affected by the proposed power scheme. This is detailed in section 0.

As part of the plan review process consideration needs to be given to the effectiveness of the current SFRs, and what SFR values should be set for other rivers and streams in the district which currently have no protection, particularly under the WARMP. This will be the subject of a separate report.

5.1.1. Wairau-Awatere Resource Management Plan

Under the WARMP only four major rivers (Wairau, Waihopai, Branch, and Awatere) have had SFRs set, and those SFRs only apply at a point, or for short lengths of those rivers. During resource consent processes other ad hoc but now generally accepted SFRs have been developed for some other water bodies; however these are not included in the plan, and are not official.

For all other rivers and streams where no SFR is defined, there is no protection for the instream habitat and recreational values of a water body and adverse environmental effects may occur as a result of abstractions.

It should also be noted that where SFRs apply only at a downstream point in the river, there is no guarantee that upstream reaches are protected. If all takes for a water body were concentrated at an upstream point, then there may still be adverse effects on the upper reaches, despite the SFR being achieved at the downstream monitoring point. The WARMP has an additional note in the allocation section to cover this situation;

- *Where application is made to take water in the upper reaches of any river, where flows may be significantly lower than those at the recording site, additional minimum flow requirements may be required for* environmental *considerations. These will be determined as required in consultation with the appropriate environmental groups, and may require habitat and fauna surveys.*

5.1.2. Marlborough Sounds Resource Management Plan

The MSRMP takes a different approach to sustainable flow regimes, specifying that the SFR for all water bodies within the plan area will be the 10 year, 7 day low flow (10Y7DLF). This applies to all rivers and streams in the MSRMP area, and can apply at any point of the water body, rather than just at a single downstream point, as is the case under the WARMP. This means that an SFR can be calculated for any point on any stream within the MSRMP area. However to define the 10Y7DLF for streams where no hydrological record exists, estimations must be done using data from recorders on the major rivers such as the Rai, Pelorus, Kaituna, and Kenepuru.

5.1.3. Proposed National Environmental Standard on Ecological Flows

The Government, through MfE, has released its *Proposed National Environmental Standard (NES) on Ecological Flows and Water Levels*. If accepted the standards in this document will apply as a default to any water bodies where the local Regional Council has not set minimum flows, or SFRs. However consideration of this NES has taken considerable time so far and there is no guarantee of when or if it will be finalised.

The proposed standard has been prepared by a very diverse panel, comprising representatives of government departments such as DoC and MAF, local bodies, recreational and conservation groups, industry and primary agriculture, and iwi, with technical support from numerous government and consultant scientists.

In brief, the proposal for surface water bodies is that the default EF is as follows:

- *For rivers and streams with a mean flow of less than or equal to 5 m^3/s, the EF shall be 90% of the Mean Annual 7 day low flow (MALF7).*
- *For rivers and streams with a mean flow greater than 5 m^3/s, the EF shall be 80% of the Mean Annual 7 day low flow.*

If adopted this NES would have the following application within the Marlborough District;

For the area covered by the Wairau – Awatere Resource Management Plan only the Wairau, Awatere, Waihopai, and lower Branch rivers have SFRs specified in the plan, and those SFRs only apply to isolated points on the rivers, rather than applying to all reaches. It is debateable whether these few point SFRs would meet the requirements of the proposed NES. Therefore the NES would probably apply to all reaches other than those relevant to the point SFRs.

For all other rivers and streams the ecological flows specified in the proposed NES would apply until such time as SFRs have been set through the plan process.

The formula proposed in the draft NES is one possible default option for protecting Environmental flows across the WARMP area, where SFRs have not already been set. Given the diversity of the NES panel the proposed figures can be considered to have had a high level of expert input.

For the area covered by the Marlborough Sounds Resource Management Plan there are default SFRs in place for all rivers and streams, so the NES would not apply.

Interestingly the general concept of the proposed NES is not dissimilar to the MSRMP provisions, in that both the SFR and allocation limit can be calculated from flow statistics for any point on the stream. From the current wording of the proposed NES it seems that (as for the MSRMP) the EF (SFR) will need to be calculated for any point on the river or stream where it may be affected by an abstraction. From Council's experience with this method under the MSRMP some of the potential advantages and disadvantages with managing the NES can be foreseen. Although it is more complicated to administer, a continually variable EF (SFR) is a more effective way of protecting the whole length of a water body than a single point SFR.

Where possible throughout this document the appropriate NES Ecological Flow will be shown for comparison with the SFRs in Councils plans. Note that this is for information only, and does not indicate a preference for this, or any other method of setting SFRs. In general the NES figures are higher (more conservative) than the Plan figures, sometimes by up to 50%

MfE has also released a document titled *Draft Guidelines for the Selection of Methods to Determine Ecological Flows and Water Levels*. This does not specify the actual method of calculating Ecological Flows; rather it discusses how to select an appropriate method from the many methods available. Having a choice of methods, together with the accompanying scientific analysis necessary to determine an SFR, may result in the process being open to challenge, and may not give any more certainty than the current ad hoc processes.

5.1.4. Stream Depletion effects

When setting SFRs and allocation limits for rivers and streams consideration needs to be given to the extent to which it is affected by takes from the adjacent aquifer. Nearby groundwater takes can often have almost as much effect on stream flows as a direct take from the stream itself; this is known as a stream depletion effect. Because of this it is often necessary to consider surface water and groundwater in a holistic fashion, and if necessary limit groundwater takes to protect stream flows.

This is particularly the case with spring fed streams, which are essentially a surface expression of the adjacent aquifer. Examples of significant spring fed streams in Marlborough include Spring Creek, Fultons and Murphys Creeks in Blenheim, and Mill Creek in the Wairau Valley. Numerous spring fed streams occur on the Wairau Plain, fed by the Wairau Aquifer. These are discussed in more detail in the groundwater report prepared by Peter Davidson.

Setting aquifer limits to manage stream depletion effects can be complex and requires a good knowledge of the aquifer properties, and it's interaction with the surface water body.

5.1.5. Variably flowing surface water resources

A few Marlborough rivers and streams have the unusual characteristic of being dry for short reaches, and yet flowing strongly, both upstream and downstream. These water bodies are typically in very high permeability gravels, such as the alluvial schist materials of the Marlborough Sounds, and Wairau north bank areas. This means that the underflow through the bed gravels can be very high, and if local bed levels are raised as a result of aggradation, the water simply flows straight through the bed material. This gives the impression that the stream has dried up, sometimes for hundreds of metres, whereas the water flow is actually just below the bed gravels.

These rivers or streams are not ephemeral or intermittent in the true sense, as the majority of the flow usually reappears at some point down stream.

This variable flow characteristic makes it difficult to set SFRs and allocation limits, as the true extent of the catchment resource is not easily ascertained. In most rivers it is usually necessary to consider fish passage as a factor when setting SFRs, however with variable streams continuity of fish passage is not maintained naturally, so for these streams the aim may be to ensure that residual refuge pools for fish are maintained.

Similarly setting allocation limits needs to recognise that the resource may be substantially larger than can be measured as surface flow. Large volumes of water may be available to be pumped from the residual pools with no apparent effect, as the very large associated groundwater resource acts as a buffer. Such streams need to be assessed as a combined groundwater/surface water resource, which is much more complex than a simple surface water assessment.

A good example of variable flows in Marlborough is the middle to lower reaches of the Waikakaho River, but other examples can be found on the Wairau north bank, and in Marlborough Sounds rivers such as the Tunakino, and Kenepuru.

5.2. Allocation Limits

Allocation limits are used to restrict the total amount of water taken from a river or stream. For surface water resources, the allocation limit could also be said to be the safe yield of the water resource. Allocation limits are not set to protect minimum in stream values; that is the purpose of the SFR. The allocation limit ensures a range of flows are maintained in a river or stream, providing protection for ecological and habitat components which require flow variability. The greater the allocation, the more often the minimum flow is reached. A river held at its minimum flow for a sustained period of time is said to have “flat lined”; this can adversely affect aquatic biota, as flow variability is an essential part of a healthy aquatic environment.

5.2.1. Wairau-Awatere Resource Management Plan

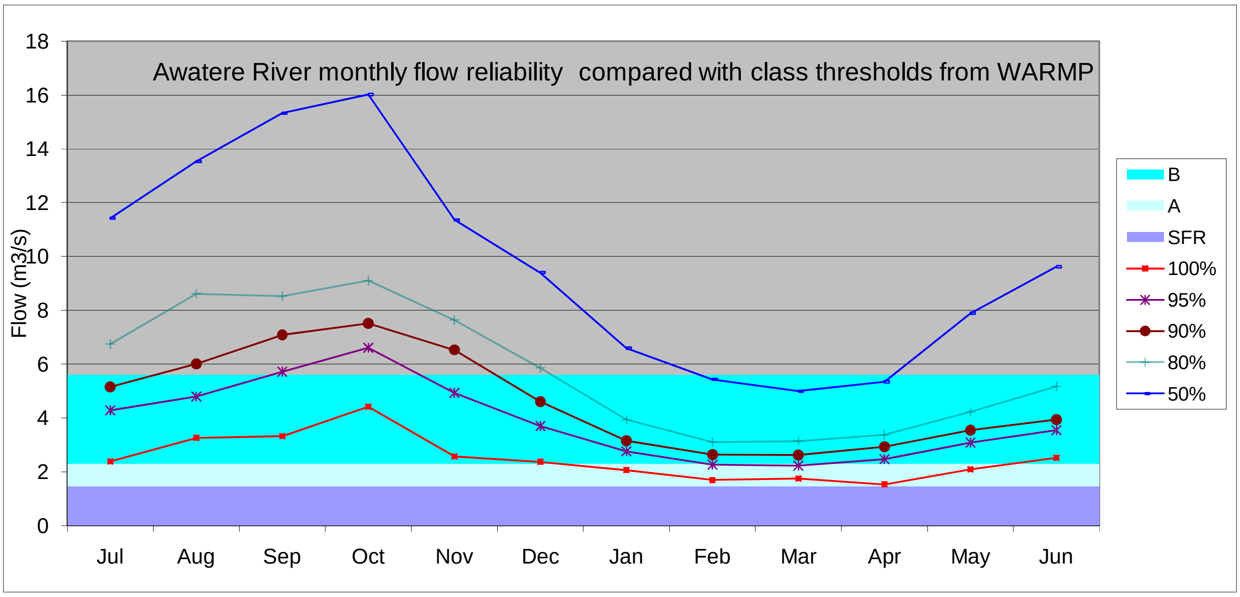
Under the WARMP a three tiered allocation system is used for three major rivers (Wairau, Waihopai, and Awatere). Class A has a high level of reliability, typically around 98%. Class B is less reliable, nominally 80% throughout the year. Class C is less reliable again, and is primarily intended to allow water to be taken to storage during higher flows.

To overcome the potential flat lining of rivers and streams the WARMP incorporates an environmental flow sharing regime within classes B and C. This requires that one third of the flow within classes B and C is retained as an additional ecological flow. This is designed to act as a secondary SFR, although there are issues with its implementation as will be discussed later.

The principles of the three tiered allocation system and environmental flow sharing have also been incorporated in a number of the less formal, ad hoc consent regimes which have developed in some catchments through the resource consent process.

Reliability

Reliability of river flows varies day to day, month to month. Reliability is often expressed on an annual basis; however this can be misleading to the layperson. For instance a river which is nominally 95% reliable on an average annual basis may actually be restricted for 30 continuous days during February in a 1 in 5 year low flow situation. By way of example monthly reliabilities for the Awatere River are shown below, however note this is still an average monthly basis, and does not necessarily reflect the 5Y7DLF situation.



It can be seen from this graph that the Awatere Class A allocation is quite reliable, being fully available on average at least 95% of the time through the main irrigation months of January to March. However Class B is relatively unreliable through these months with a 50% plus likelihood of restrictions being necessary from February to April in an average year, even though it is nominally available 80% of the time.

Specific discussion on the reliability of individual water resources is detailed in later sections.

This is a feature of the multi-class allocation system of the WARMP. While the system enables allocation of much more water than a regime with conservative allocations, it is at the cost of reliability. It needs to be noted that many capital intensive projects, particularly vineyards, have been developed with reliance on class B consents, with no backup from storage or other sources.

Rationing within a class

Inherent in the WARMP allocation regime is the principle of treating users equally within a class, and rationing them all from the point at which water is 100% available, to the point at which no water is available. If this is not done the taking of water is likely to breach the SFR, with possible adverse environmental consequences. While the plan discusses how rationing is to happen, no formal in house regime has ever been instituted to allow this to happen, and no programme of education has taken place with users. To date under utilisation of consents has provided a degree of protection to surface water resources, and no adverse effects, or serious breaches of SFRs have been observed. However if the current allocation regime is to continue, and particularly if increased utilisation and efficiency is achieved through other changes, then it is likely that SFRs would be breached if rationing is not implemented, with probable adverse environmental effects.

Class C upper limit

Currently there are no upper limits on class C takes under the WARMP. At the time of the development of the current plan it was considered beneficial to allow higher flows to be taken to storage, as this water was only being “wasted” otherwise. However during the operation of the plan it has become apparent that there are management and equity issues arising from having an unrestricted class C allocation.

Although it is not specifically stated in the WARMP, it is necessary to ration or restrict class C abstractions, to ensure that all class C abstractions are being taken from flows within the class C band, above the minimum class C threshold. For instance the total class C allocation from the Waihopai River is currently 2.66 m^3/s, and all class C takes must cease at 3.6 m^3/s. For all takes to be fully operational, and also allow the additional 50% in stream share required by the plan, the flow in the river must be at least 7.6 m^3/s. Once flows fall below this level rationing is necessary to ensure all users have a share, without breaching the 3.6 m^3/s class C limit.

In order to accommodate growing numbers of class C consents, particularly from the Awatere and Waihopai Rivers, the threshold at which class C should be rationed increases with every consent issued. This in turn reduces the reliability of the class C consents for other class C users. There needs to be discussion about the future operation of class C consents, and whether an upper limit is required on this class to provide some certainty of reliability for users.

Environmental flow sharing regime

Another issue specific to the WARMP relates to the two thirds, one-third flow sharing regime intended for classes B and C, whereby for every two units of water allocated, one additional unit is to be left in stream for environmental protection. The principle of this is sound; however for various logistical reasons it has never actually been put into practice by Council. Fortunately the underutilisation of the surface water consents discussed earlier provides a buffer, and no adverse effects have been apparent to date. However it must be noted that Council does not routinely monitor all surface water resources for adverse effects, and it cannot categorically be said that there have not been any adverse effects. If a higher degree of utilisation is achieved through different methods of allocation, or re-allocation, then the environmental flow sharing regime will need to be operated more stringently to avoid possible adverse environmental effects. Alternately a different method of ensuring environmental flow variability may be required.

Stacked consents

Within the WARMP area there are some small catchments which have no allocation limits under the plan, where water has been allocated in a “stacked” manner. This means that the minimum threshold at which a consent may be exercised is higher than the preceding consent, and allows one consent to be fully operational before the next consent can be exercised. This means that each subsequent consent has lesser reliability. In some cases an environmental flow share has also been inserted between each consent, or submissions from the first consent holders have resulted in quite high “buffers” between them and the next consent holder. Cases where “stacking” has occurred include the Tuamarina catchment, the Flaxbourne River, and Are Are Creek.

Often this ad hoc method of allocation has been the result of strong opposition to a new consent from an existing consent holder, who has sought to have their consent protected from any adverse effect. The resulting consent may have been decided by hearing, or negotiation prior to hearing. Once a stacking system has occurred, there is an expectation that subsequent consents will be treated in the same manner. However it must be noted that as this allocation system is not detailed in the WARMP policies or rules, a future consent applicant could challenge this system, and attempt to have their consent treated in a different manner.

Stacking is the simplest example of the first come, first served principle on which many water allocation regimes are based. The class system of the WARMP is an adaption of stacking; consents are grouped into classes with common restriction conditions, with the earlier (higher class) consents having priority over the later (lower) class consents.

There are a number of disadvantages of this method; compliance monitoring is more complex, flat lining is more likely (unless an environmental buffer has been included), and the later consents may be unreliable to the point of being virtually useless. However now that this system has been put in place for some catchments it has created a hierarchy of consents, and an expectation, which is difficult to change without disadvantaging some consent holders. Any change which may be proposed during the plan process will have to consider the possible effects on the consent holders with the highest degree of reliability.

5.2.2. Marlborough Sounds Resource Management Plan

The MSRMP specifies that the allocation limit for all water bodies within the plan area shall be 30% of the 5 year, 7 day low flow (5Y7DLF). To add a level of complexity to this the 30% is divided into two parts, with half being available for long term consents, and half for short term (single season) consents. As discussed in the SFR section above, determining the 5Y7DLF is not easy for streams where no hydrological record exists, and estimations must be done using data from recorders on the major rivers such as the Rai, Pelorus, Kaituna, and Kenepuru rivers.

The setting of allocation limits under the MSRMP can be done by calculation for any given point on a river or stream, meaning there is little danger of a large consent being allocated in the upper reaches of a catchment, where the flows are not sufficient to supply the allocation.

5.2.3. Proposed National Environmental Standard on Ecological Flows

The proposed NES on Ecological Flows also includes provisions on allocation limits from any water body which has no default allocation limits.

In brief, the proposal for surface water bodies is that the default allocation limits are as follows;

- *For rivers and streams with a mean flow of less than or equal to 5 m^3/s, the allocation limit shall be 30% of the Mean Annual 7 day low flow (MALF7).*
- *For rivers and streams with a mean flow greater than 5 m^3/s, the allocation limit shall be 50% of the Mean Annual 7 day low flow.*

If adopted this NES would have the following application within the Marlborough District;

Of the area covered by the Wairau – Awatere Resource Management Plan only the Wairau, Awatere, and Waihopai Rivers, and Gibsons Creek have allocation limits (on class A and B). However the fact that the class C allocation from these water bodies has no limit does complicate the matter, and it may be argued that as there is no class C allocation limit, there is also no overall allocation limit and so the default NES provisions should apply. These three rivers would then be deemed to be over allocated in terms of the NES.

All other rivers and streams in the WARMP area, including all tributaries of the rivers listed above, have no allocation limits, so if adopted the NES would apply to all of those water bodies until such time as allocation limits have been set through the plan process.

The formula proposed in the draft NES is one possible default option for setting allocation limits across the WARMP area, where these have not already been set

For the area covered by the Marlborough Sounds Resource Management Plan there are default allocation limits in place for all rivers and streams, so any NES would not apply. It is worth noting that the MALF7 and 5Y7DLF for all rivers and streams in the MSRMP are both less than 5 m^3/s, and are numerically very close, so the allocation limit of 30% for the current plan and the NES will be very similar.

Variably flowing streams (those which are sometimes dry for short reaches, but may connected to a significant groundwater resource) are not well covered by the Proposed NES on Ecological Flows, which would probably suggest a zero allocation from that resource, when that is often far from reality. These are often in high rainfall areas, and may be able to sustain significant abstractions with less than minor adverse environmental effect.

Similarly calculating the NES for Intermittently flowing water bodies may result in higher than sustainable figures, particularly where the flow measurement site is upstream of significant losses to a groundwater resource which is reliant on that recharge for sustainability. The Southern Valleys catchments are good examples of this situation.

5.3. Permitted Activity Takes

Both of the District's Resource Management plans make provision for water to be taken as a permitted activity, subject to certain standard conditions. These are generally for stock, domestic, and other minor uses. For instance under the WARMP it is permissible to take up to 10 m^3/day for domestic needs, and up to 10 m^3/day for the reasonable needs of an individual's animals for drinking water (plus an additional per head amount for larger blocks with higher stock numbers), over most of the district (excluding the Wairau Aquifer).

The taking of 10 m^3/day for domestic needs has been the subject of much discussion during subdivision consents in recent years, for several reasons;

- There is no apparent justification for 10 m^3/day just for domestic use. Commonly accepted values for domestic use range from 140 to 170 litres per person per day, meaning that there are few households which would require more than 1 m^3/day.
- There is no SFR provision in the standard domestic use conditions, so there is no environmental protection for water bodies from these takes.
- The 10 m^3/day figure has subsequently been argued as a permitted baseline for other uses.
- The permitted activity status effectively makes any subdivision consent a de facto water consent, however subdivision consents do not routinely consider the impacts of potential water use on water use in the Assessment of Environmental Effects (AEE).
- Uncontrolled conversion of pastoral land to rural residential subdivisions, with each lot using its permitted 10 m^3/day from the same small stream could have adverse environmental effects on the stream.

Under the MSRMP "*the taking or use of water for an individuals reasonable domestic needs, or the reasonable need of an individuals animals for drinking, from an naturally occurring water body is a Permitted Activity*". This provision overcomes the issues which arise from the numerical allocation in the WARMP, however there will always be debate over the assessment of "reasonable".

The appropriate limits for domestic use and stock water use will need to be considered during the plan review process, with due regard given to possible effects on the environment, reasonable needs, methods of assessment, and monitoring and compliance.

5.4. Municipal Supplies

Municipal supplies need to have a high level of reliability, and consents are usually issued for these takes on an unrestricted basis. However these takes can have a significant effect on the environment in a dry season, if exercised in an uncontrolled manner. Several of Marlborough's municipal supplies have some of the highest per capita use in the country, well in excess of the reasonable domestic use discussed above. Most municipal supplies are taken from groundwater, for better security of quality, and so do not impact greatly on surface water resources. However there are some exceptions, such as the Awatere Community Supply, which is taken from Black Birch Stream, a tributary of the Awatere. While there should be security of supply a community scheme such as this, it could be at the expense of the Black Birch low flows, and the Awatere SFR. It is reasonable to expect that under very low flow circumstances when consented irrigation is restricted, or shut off, domestic water use is also kept to a minimum, and unnecessary usage, such as watering lawns is strictly controlled. The same principle should apply for any community scheme which may have an impact on a small stream.

5.5. Storage Dams

Storage of irrigation water in dams is a common practice in Marlborough, particularly in the drier East Coast area, usually in association with lower reliability class B and C consents, or water harvesting from small catchments. There are about 250 irrigation storage dams in Marlborough ranging in size from 10,000 m^3 up to 1,000,000 m^3, as well as a large number of smaller stockwater dams. Some of the larger dams are partnership, or company based. Storage of water allows better use of a seasonally short resource, and provides certainty for users. However in some cases storage dams may impact significantly on the sustainability of a resource, and need to be assessed carefully.

In the East Coast area where there are few perennial water sources available, dams are common. Users seek to fill their dams in the shortest possible time, sometimes by gravity fed supply from nearby streams. Limited information on flows in small streams often hinders the setting of appropriate SFRs. Large volume takes end up competing with each other for the resource, and consent conditions need to be written to give priority on a first in first served basis. However these issues can generally be overcome during the consent process. Where there are SFR requirements users often find compliance difficult, having not appreciated the complexity of ongoing flow monitoring.

On stream dams are often the preferred option, as the most cost effective storage sites are often in the main stream channel. These consents are even more difficult, as it may be necessary to give precedence to downstream users, as well as ensuring SFRs and fish passage over the dams as may be required. The difficulty in monitoring incoming and outgoing flows to ensure all conditions are met is such that compliance is seldom achieved. Consultants and engineers sometimes offer complex monitoring conditions in order to secure consent, often with no regard to the practicality of achieving compliance. This was particularly so during the rapid “expansion at any cost” phase in the viticultural industry. Major changes to structures and resource consent conditions have been required in some instances.

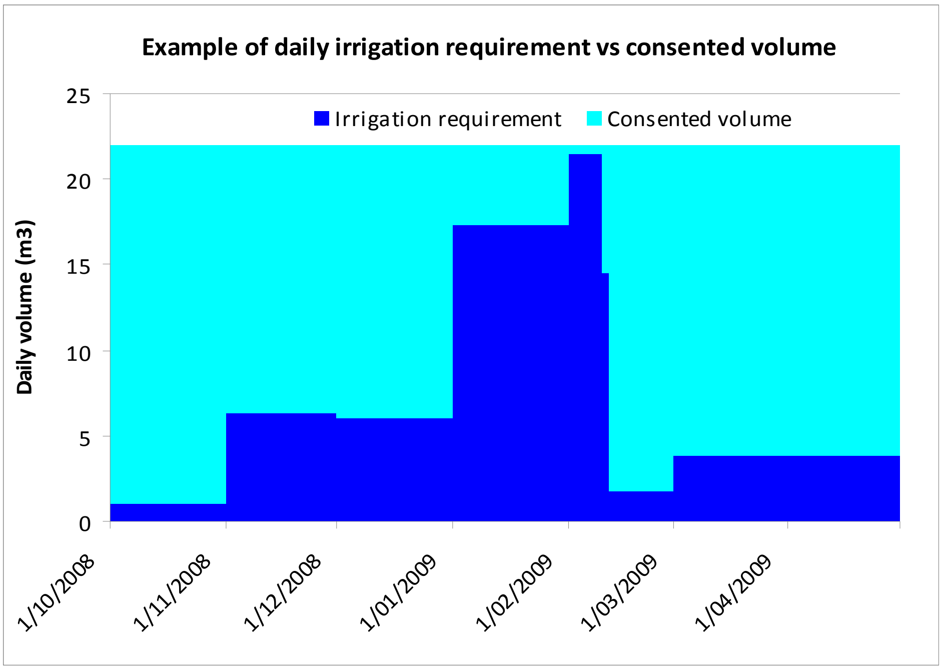
It is a fair generalisation that on stream storage dams are one of the most difficult consent applications to manage, and rules relating to these need close scrutiny during the plan review process.

5.6. Demand and Utilisation

Abstraction limits from surface water bodies need to be specified and controlled on an instantaneous, (or at least an averaged daily) basis to protect instream values. The result is that to cater for peak demand, consents are necessarily sized to that peak demand even though demand at other times of the irrigation season may be a fraction of the allocated amount.

For instance while the total seasonal water use on a viticultural block at Seddon may average 16 m^3/ha/day over a 150 day irrigation season, the daily use in November may only be 3 m^3/ha/day, and the daily use in January can be as high as 24 m^3/ha/day, (figures based on 1 in 10 year scenarios, calculated using the Spasmo model).

This is illustrated in the graph below, taken from actual meter readings in a Lower Dashwood vineyard in the 2008-09 season. It can be seen that irrigation through November and December was modest, at around 6 m^3/ha daily average, increasing to around 17 m^3/ha through January, and peaking at nearly 22 m^3/ha in early February, before reducing significantly for the rest of the season following rainfall in mid February. The pale blue area on the graph is unutilised water allocation.



5.7. Limits of Present Hydrological Knowledge

Good decision making on water resource allocation and management requires good hydrological knowledge. From a statistical viewpoint at least 30 years of record is desirable when carrying out hydrological analyses. Fortunately the Marlborough Catchment Board installed a base network in the 1960s; this was followed by the addition of a number of sites, mainly rainfall, to the network in the late 1980s, and then the addition of more river and rainfall sites over the last decade.

Council now operates a network of about twenty environmental flow recording sites throughout the district, with additional information also being available from three NIWA sites. Several of these sites have now been in operation for over 50 years, which gives good long term record to provide the base information on which to carry out hydrological investigations. In addition there is a comprehensive network of rainfall and groundwater sites to complement that knowledge.

Where information is required on a river or stream with no continuous flow record, co-relation with the most representative nearby site is required. Ideally this is done using a series of paired flow gaugings, however sometimes this is not possible, and the comparison is done using the relative catchment areas.

5.8. Limits of Future Hydrological Knowledge

With the uncertainty of the exact effects of climate change on any particular resource, the limits of hydrological knowledge are stretched further. For Marlborough the predicted effect of climate change on annual rainfall is often over simplified, and can be misleading. Looking at the predicted changes on a seasonal basis as set out below better illustrates the complexities in using climate change predictions.

NIWA analysis suggests that the east coast strip from Blenheim southwards will receive increased rainfall during summer and autumn, which may reduce irrigation requirements. However during winter and spring rainfall may be less, meaning water availability for storage may be reduced.

The opposite applies for inland and northern Marlborough, with drier summer and autumns predicted, which may limit irrigation water availability, but more winter and spring rainfall is predicted, which may improve early season river flows and soil moisture.

Other factors which will affect the availability of, and demand for irrigation water include any changes in wind and temperature. These are the key factors in evapo-transpiration, which in turn drives irrigation demand.

The lesser amount of snow received in a warmer climate scenario may also have an impact, as gradual snow melt helps base flow of the major rivers which have their headwaters in the high country, and which are the most productive in terms of water for irrigation.

The net effect of these and other variables is that the exact effect of climate change on each of the district's water resources is unknown. However it would be prudent to have some provision in the next generation plan for accommodating these uncertainties. Any provision should be sufficient to cover any possible scenarios for the life of the plan, plus the life of any consent which may be issued under that plan, being the effective term of a consent issued under that plan.

5.9. Future Water Demands for the District

Water demand is driven by economics. Where water can enhance productivity, and it is economic to do so (taking into account the costs of land purchase, development, infrastructure, and operation), then there will be demand for water. Most commonly this is for higher value end uses, such as the viticultural boom of the last decade. This high return meant that it was considered economic to develop vineyards which relied on expensive irrigation schemes, either using storage dams, or piping water long distances. The more recent decrease in returns for viticulture has meant that few developments are currently being undertaken. Dairying is showing good returns at present, and there is a steady trickle of enquiries and applications for irrigation water from larger, more reliable sources such as the Wairau River, and in the Pelorus catchment. Cropping continues to create some water demand, and where water can be pumped from a major source very cheaply there is still a small demand for pastoral irrigation.

What happens in the future will depend on future land and product prices. If land prices continue to fall as a result of the current viticultural downturn, other more economic land uses may take over from viticulture. These land uses may have higher water needs (eg dairying), which will mean more water demand. Cropping may also increase, again with a higher water demand. There are many development scenarios, and the end result remains to be seen.

6. Water Resources by Area

6.1. Marlborough Sounds Resource Management Plan Area

6.1.1. Pelorus and Kaituna River Catchments

Introduction

This area comprises the two main river systems which flow into the Marlborough Sounds at Havelock. Of these the Pelorus is much larger, having a catchment area (CA) of about 870 km^2, including its major tributaries the Rai River (CA 210 km^2) and the Wakamarina (CA 190 km^2). The catchment is a mix of bush covered hills and exotic forest, with pastoral land dominating the valley floors.

The Kaituna River (CA 150 km^2) enters the Havelock estuary from the southern side, draining a valley dominated by pastoral farms on the river flats, with bush and forestry on the hills

Rainfall and climate

The Pelorus is a high rainfall area generally between 1600 and 2000mm, but with some sites averaging in excess of 2400mm annually. Rainfall in the Kaituna catchment is less, at around 1400 – 1800 mm. Major rain events come from the north to north-west quarter, and can be of very high intensity. During a major storm event in December 2010, over 180 mm fell in just 6 hours at Councils Tunakino raingauge, with anecdotal reports of higher falls nearby. Council operates four raingauge sites in the area for resource analysis and flood monitoring purposes.

Hydrology

Not surprisingly rivers in the area have very good base flows, and floods can be large. Council operates two flow recording sites, one on the Rai River, and one on the Kaituna River, and also has access to data from a NIWA site on the Pelorus, just above the Rai confluence. This gives a good record to work with for flow analysis, although the Kaituna River record is not yet long enough for confident analysis.

	Rai River at Rai Falls (record begins 1979)	**Kaituna River at Readers Road (record begins 2006)**	**Pelorus River at Bryants (record begins 1977)**
Catchment area	211 km^2	133 km^2	375 km^2
Mean flow	11.4 m^3/s	4.3 m^3/s	20.1 m^3/s
Minimum recorded flow	0.58 m^3/s	0.29 m^3/s	1.09 m^3/s
Maximum recorded flow	828 m^3/s	175 m^3/s	1930 m^3/s
Mean annual low flow (7 day)	1.24 m^3/s	0.41 m^3/s	2.12 m^3/s

Plan provisions

These rivers are covered by the MSRMP (as described in section 5), meaning that allocation limits are specifically calculated pro rata at the point of any water abstraction, and SFRs are calculated for the relevant recording sites to act as trigger levels for consent shut off. SFRs for the recording sites are shown below;

SFRs and proposed NES values for Pelorus and Kaituna catchments		
Site	**SFR**	**Proposed NES**
Rai at Rai Falls	1.00 m^3/s	0.99 m^3/s
Pelorus at Bryants	1.47 m^3/s	1.70 m^3/s
Kaituna at Readers Road	0.28 m^3/s	0.37 m^3/s

The system of long term and short term consents is a reflection of the low interest in irrigation water at the time the MSRMP was finalised in 2000. The significant uptake of irrigation water since that time means that the regular operation of short term consents has become onerous for both irrigators, and Council staff. This system needs revisiting during the plan review process.

Current level of allocation – Pelorus River

The valley floor of the Pelorus River and its tributaries are favoured for dairying, being in a reliable rainfall area, and as having many surface water resources to provide irrigation water as backup. While irrigation was not widespread a decade ago when the MSRMP was finalised, the returns from dairy farming have meant that that irrigation is now routine, as farmers seek to increase production.

The upper reaches of the Pelorus catchment above the Rai confluence (375 km^2) is generally bush clad and has a limited amount of pastoral land available. There are a number of small farms near the lower end, with lifestyle block becoming popular. As a result there are no major consents in this reach.

In the lower reach from the Rai confluence to the Havelock estuary there are some dairy farms, which use water for irrigation, and the available long term water allocation limit is fully allocated.

The Rai River catchment includes three main tributaries, the Ronga, Tunakino, and Opouri Rivers, and totals about 210 km^2. Much of the available farmland is used for dairying, and the available long term water allocation limit is fully allocated.

For allocation management purposes the Pelorus River is divided into a number of reaches, each with its own allocation limits.

Current level of allocation – Kaituna River

The Kaituna River area is also suited to dairy farming; however this is less prevalent than in the Pelorus-Rai area. Some irrigated cropping also takes place. In the mid to upper reaches of the catchment allocation limits have been reached, but there is still allocation remaining near the lower end of the catchment.

The Havelock community supply, which supplies a population of approximately 540 people, is drawn from an aquifer at the lower end of the Kaituna River valley which has hydraulic connection to the Kaituna River. The consented abstraction of this supply (0.023 m^3/s) is not included in the Kaituna River allocation.

Summary of allocation status – Pelorus and Kaituna Rivers

The Pelorus River, and its major catchments (Rai, Tunakino, Opouri and Ronga) have been split into reaches for the purpose of allocation. Each reach has an allocation limit that is reserved for that reach. The Kaituna River allocation is calculated for any point of abstraction on the river.

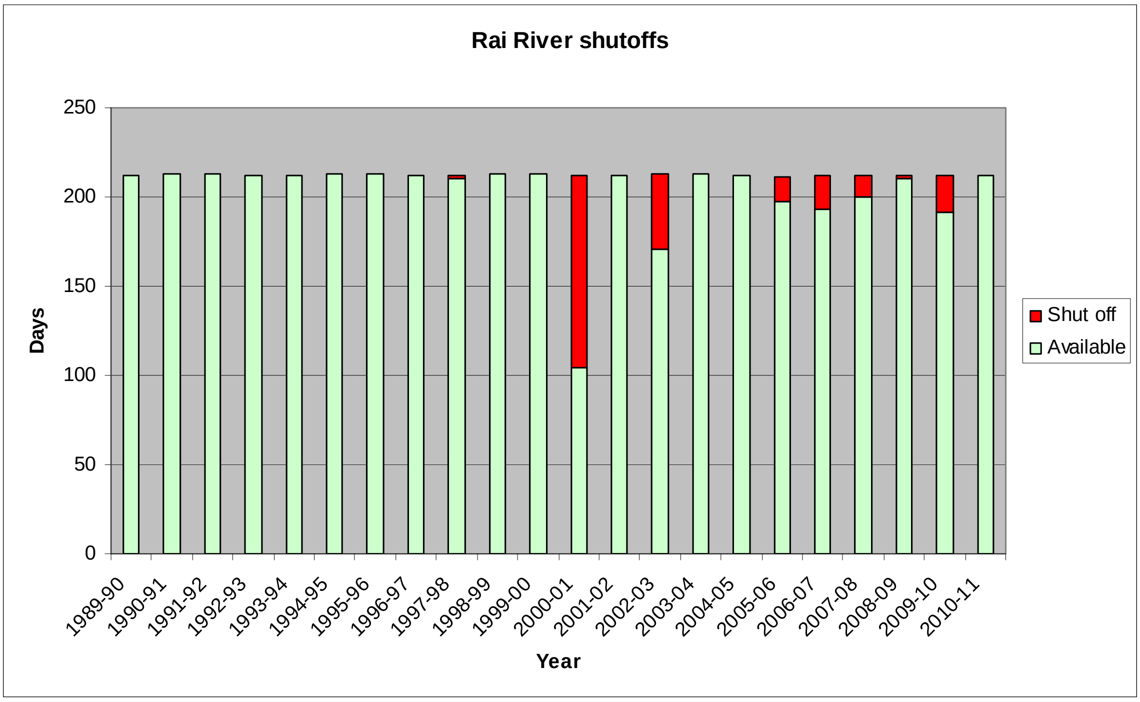
Allocation limits - Pelorus and Kaituna Rivers			
River	**Permit class**	**Allocation limit**	**Current allocation**
Lower Pelorus River (below Wakamarina)	Long term	0.357 m^3/s	0.357 m^3/s
	Short term	0.357 m^3/s	0 m^3/s
Pelorus River (above Wakamarina conf.)	Long term	0.179 m^3/s	0.179 m^3/s
	Short term	0.179 m^3/s	0 m^3/s
Rai River (excluding major tributaries)	Long term	0.058 m^3/s	0.058 m^3/s
	Short term	0.058 m^3/s	0.032 m^3/s *
Opouri River	Long term	0.059 m^3/s	0.059 m^3/s
	Short term	0.059 m^3/s	0.022 m^3/s *
Tunakino River	Long term	0.028 m^3/s	0.027 m^3/s
	Short term	0.028 m^3/s	0 m^3/s
Ronga River	Long term	0.027 m^3/s	0.027 m^3/s
	Short term	0.027 m^3/s	0.023 m^3/s *
Total Pelorus Catchment	**Long term**	**0.708 m^3/s**	**0.707 m^3/s**
	Short term	**0.708 m^3/s**	**0.077 m^3/s ***
Kaituna River	Long term	0.051 m^3/s	0.035 m^3/s
	Short term	0.051 m^3/s	0.009 m^3/s *

It can be seen that with the exception of the Kaituna River, where there is some allocation available at the bottom of the catchment, the long term allocation is fully subscribed. Short term allocation is available in most areas, however it must be noted that any available allocations may be specific to a part of a catchment, and may not be available at other points in that catchment.

*It should also be noted that the short term allocations as listed were those for the 2010-11 irrigation season. These will have now expired, but as they are regularly utilised it is presumed that these, or similar consents will again be operative during the next irrigation season.

Rai River reliability

The graph below shows the number of days during each irrigation season (Oct-April incl) which the Rai River allocation would have been shut off (un-available) over the full length of the river record. The 2000-01 drought was a major event, and shutoffs would have been extensive, however at this time there was no significant irrigation from the Rai River. Since then shutoffs have been a fairly regular occurrence, as shown by the number of days when water has been unavailable. The Rai flow recording site is downstream of all irrigation takes, so the recorded flow in recent years is not the natural river flow as it includes the effects of the upstream abstractions.



Summary of current status – Pelorus and Kaituna River catchments

- The MSRMP rules specify generic SFR and allocation limits for rivers and streams which are designed to ensure sustainability.
- Long term allocations are fully subscribed
- Short term allocations available in most (but not all) areas

6.1.2. Marlborough Sounds

Introduction

The Marlborough Sounds is a complex system of drowned valleys with a land area of 1470 km^2, and over 1500 km of coastline. Numerous rivers and streams discharge directly to marine water. There is very little land suitable for irrigated agriculture, except some valley floors adjacent to a few of the larger river systems such as at Linkwater, and the head of the Kenepuru Sound.

Rainfall and climate

The Marlborough Sounds is generally a high rainfall area, similar to the Pelorus and Kaituna catchments.

Hydrology

Due to the very high number of small stream, records are limited to a number of one off gaugings on some of the larger streams. NIWA have a recording site on the Kenepuru River, which is useful as representative record for the area.

Kenepuru River at Kenepuru Head	**(record begins 1980)**
Catchment area	30 km^2
Mean flow	1.25 m^3/s
Minimum recorded flow	0.00 m^3/s
Maximum recorded flow	115 m^3/s
Mean annual low flow (7 day)	0.022 m^3/s

A low flow of zero is regularly recorded at this site, which is not a true indication of the available water resources in the area. It is more likely that this river behaves like the intermittently flowing rivers discussed earlier, and that there are groundwater resources available in the river gravels.

Plan provisions

The Marlborough Sounds are covered by the MSRMP (as described in section 5), meaning that it is necessary to calculate allocation limits and SFRs pro rata at the point of any water abstraction. Because the Kenepuru River sometimes dries up at the recording site it is not possible to calculate an allocation or SFR for that site. Instead it is usually necessary to use figures from the Rai River, or some other data as may be considered more representative. However under the proposed NES an Environmental flow could be calculated, as shown below;

SFRs and proposed NES values for Kenepuru River		
Site	**SFR**	**Proposed NES**
Kenepuru River at Kenepuru Head	Not able to be calculated	0.020 m^3/s

Current level of allocation

Apart from a few consents at Linkwater, there is little irrigation demand in the Marlborough Sounds area. However the popularity of the area for lifestyle and holiday homes creates a different water requirement in this area. Many small community water schemes have sprung up in the area, and most of these are required to have consent for their water takes. In general these schemes predate the plan, and little regard is given to the plan provisions in allocating community scheme consents.

The Picton community supply, which supplies a population of approximately 4200 people (this increases by about 25% in the summer holiday season), is taken in part from surface water in the Waitohi River catchment. This water is stored in Barnes Dam, on the Waitohi River, and gravity fed to the Picton Township. Some water is also drawn from an aquifer in the Tuamarina Valley, outside of the Marlborough Sounds catchment area. Because of the need for security of the long standing community supply, no SFR has been placed on the Waitohi River. Water shortages in Picton are common in drier seasons, and restrictions are used to conserve supplies. Council, as the water network operator is investigating other sources of water for Picton to supply current seasonal shortfalls, as well as possible future growth.

Some micro hydro schemes have been installed to supply electric power in remote areas of the outer Marlborough Sounds. Only a few are consented, but it is understood that there are also a number of un-consented schemes. These schemes may divert all low flows away from small streams, placing native fish habitat and access at risk.

Future allocation

There is likely to be continued demand for subdivisions in the Marlborough Sounds. Many of these will seek domestic water supplies from the many small streams. In addition the recent trend for micro hydro schemes is likely to continue in the more remote areas.

Summary of current status – Marlborough Sounds

- The MSRMP rules specify generic SFR and allocation limits for all Marlborough Sounds rivers and streams which are designed to ensure sustainability.
- In the case of small community water supplies these rules are not necessarily adhered to.

6.2. Wairau River Main Stem Reaches

Introduction

The Wairau River main stem has been considered as a separate water resource in this report, although it is of course reliant on its tributary flows. Individual discussion is included later in this document on individual reaches, but it is first necessary to introduce the common issues. For the purposes of this report the Upper Wairau River has been treated as a tributary, rather than part of the main stem.

Hydrology

Flow records relevant to all Wairau River main stem records are taken at the Tua Marina State Highway 1 (SH1) bridge site. This site has over 50 years of record. Note that with the significant uptake of Wairau class B consents (about 9 m^3/s allocated) it is considered that for flow analysis relating to any flows less than the median flow (60 m^3/s) that the useful record at this site should be limited to flows before 2005, since then flows may have been compromised by abstractions.

Wairau River at Tuamarina	**(record begins 1960)**
Catchment area	3430 km^2
Mean flow	98 m^3/s
Minimum recorded flow	2.5 m^3/s
Maximum recorded flow	5900 m^3/s
Mean annual low flow (7 day)	13.4 m^3/s

Plan provisions

The main allocation provisions for the Wairau River in the WARMP are as follows;

Summary of main WARMP allocation provisions for the Wairau River		
SFR flow	8.0 m^3/s at Tuamarina 14.0 m^3/s at The Narrows	(Proposed NES 10.7 m^3/s) (Proposed NES 16.3 m^3/s)
Class A allocation	No class A allocation (this was reserved for recharge of the Wairau aquifer)	
Class B allocation	15 m^3/s when flow is above 30 m^3/s at Tuamarina recorder, progressively reducing to 0 at flow of 8.0 m^3/s	Current allocation 9.0 m^3/s
Class C allocation	67% of any flow in excess of 30 m^3/s at Tuamarina recorder, no upper limit	Current allocation 0.71 m^3/s

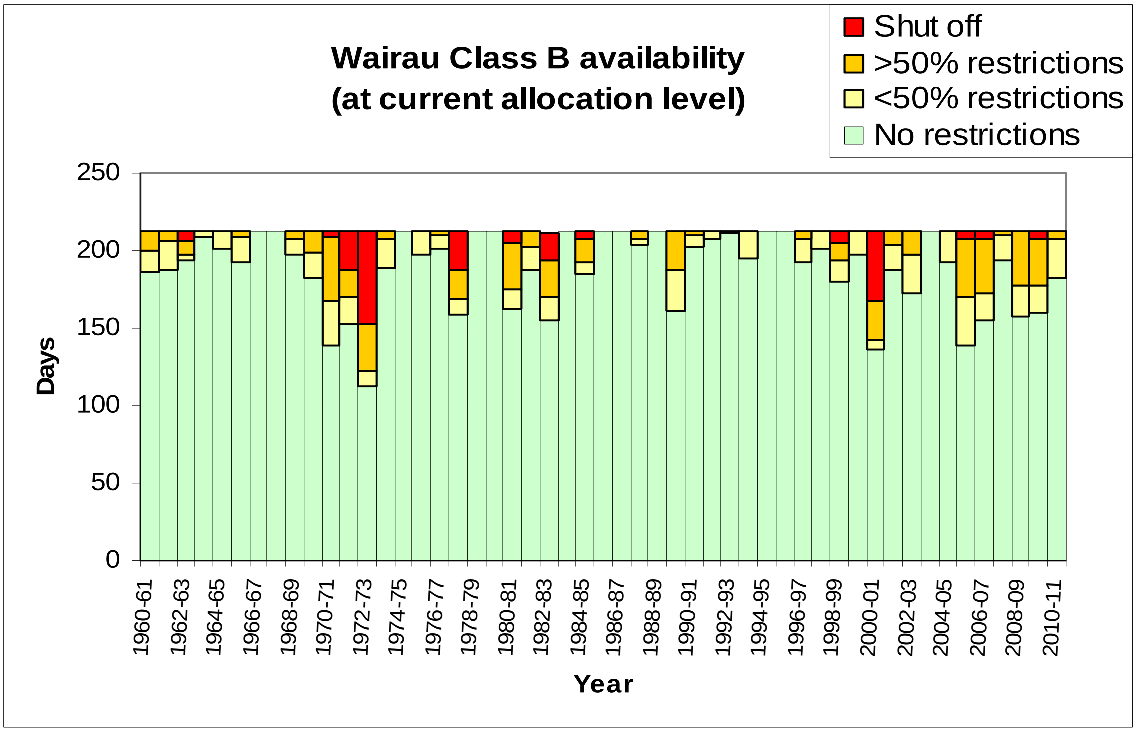
Reliability of allocation

The reliability of an allocation class is an important factor for users to consider when applying for consent to use water. The following table shows the amount of time which each class of allocation is fully available for each month of the year. It can be seen that the Class B allocation is quite reliable, being fully available on average at least 93% of the time through the main irrigation months of January to March. No reliability figures are shown for class C, as this is a variable threshold which is dependant on the volume of class C allocated (see section 5.2.1, class C upper limit). Note also that as monitoring takes place downstream of the abstraction points (as opposed to upstream as is the case with the Waihopai and Awatere rivers), the reliability of the SFR flow will be the same as the reliability of class

B. This does reflect the fact that the environmental flow sharing regime is difficult to operate when monitoring takes place downstream.

Wairau River monthly reliability table (% of time allocation available based on full allocation)												
Availability	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
30 m^3/s (B fully available)	72	52	51	60	78	84	87	89	96	96	92	87
14 m^3/s (B 50% available)	95	81	82	88	96	98	98	98	99	99	100	98

The graph below shows the number of days during each irrigation season (Oct-April incl) which the Wairau River allocation would have been restricted or shut off (un-available) over the full length of the river record. The 1972-73, and 2000-01 drought events were major, and shutoffs would have been extensive, however at this time there was no significant irrigation from the Wairau River. Since then restrictions have become more frequent, due to increased utilisation of the resource. The Wairau flow recording site is downstream of all irrigation takes, so the recorded flow in recent years is not the natural river flow as it includes the effects of the upstream abstractions.



Current level of allocation

Allocation for the Wairau River is done globally, rather than reach by reach. In total about 9 m^3/s has been allocated from the river, of this over half is held by two community based schemes;

- Southern Valleys Irrigation Scheme (SVIS) – a Council facilitated community scheme which diverts up to 2.5 m^3/s from the Wairau River just below the Waihopai confluence, for the purposes of irrigation (up to 1.1 m^3/s), re-watering, and groundwater recharge.

- Wairau Valley Water Enhancement Scheme (WVWES) – have consent to abstract up to 3.3 m^3/s from near the Branch confluence to provide irrigation water for up to 6000 ha of land in the Wairau Valley. This consent is as yet unexercised, as the WEVWES group are hoping to be able to distribute their water via the canal for the proposed TrustPower Wairau HEP scheme, if and when that scheme proceeds.

The remainder of the allocated water is predominantly from the reach from the Waihopai to Wash Bridge, and it should be noted that there is considerable duplication of consents in this reach. The consent granted to the Wairau Valley Water WVWES duplicates existing consents for the area which cover approximately 3000 ha of land. If the WVWES becomes operational, a rationalisation of consents in the area will be necessary to avoid duplicate allocation of water. Once reviewed it is estimated that the allocated amount will reduce by approximately 1.6 m^3/s, providing the predominant land use does not change.

To date the amount of class C allocated from the Wairau River is relatively small, a result of ongoing class B allocation still being available.

All takes from tributaries are treated as being part of the Wairau global allocation, with the exception of the Waihopai as discussed below.

Waihopai anomaly

The Waihopai River joins the Wairau above the groundwater recharge reach, and as such contributes to the low flows in this reach. While all other Wairau tributary inputs have underlying Wairau class B SFR and allocation conditions, in addition to any conditions imposed to protect the local water resource, this practice has never been followed for the Waihopai. It had originally been assumed that the Waihopai class restrictions would provide equivalent protection for the Wairau, and therefore the additional level of protection was not needed, however it has since been shown that this is not always the case. The sum of Waihopai class A and B consents is 1.45 m^3/s, which arguably should have an underlying Wairau class B status. Not limiting or restricting Waihopai consents based on Wairau SFR limits during low flow conditions is not equitable for other Wairau consent holders, and may cause flows to fall below the Wairau SFR. This issue needs to be reviewed during the plan review process.

Future allocation

There is scope for future allocation; however most of the land adjacent to the river is already served by irrigation water. One possible demand could come from proposals further away from the river, as has already been the case with the Southern Valleys intake (see Wairau Plains section). Such proposals could possibly involve the gravity transfer of water from further up the river to areas such as the lower Omaka River Valley, or the Are Are Creek/Kaituna area. Any such proposal would need to be in line with the WARMP provisions, and the potential constraints imposed by the TrustPower consent.

Summary of current status – Wairau River Main Stem

- There is no class A allocation, a recognition of the significant losses to groundwater.
- There is a global class B allocation limit for the main stem, which is applied so as to include any takes from tributary flows.
- The class B allocation stands at 67% of the allocation limit, although the potential for future allocation is limited by the lack of suitable land.
- The plan rationing provisions are not currently applied to class B; this could endanger the environmental sustainability of the resource.
- The Waihopai River is not included within the class B limits, this is not equitable with other Wairau River users, and could cause environmental sustainability issues.
- The unlimited Class C has a relatively low level of allocation.

6.2.1. Lower Wairau River and Wairau Diversion

Reach description

The lower reaches of the Wairau River flow meander for about 14 km from SH1 to the sea at the Wairau Bar. From SH1 a flood diversion channel, the Wairau Diversion, takes a more direct 5 km route to the coast approximately 7 km north of the Wairau Bar. Both are fully stopbanked, and tidal for most of their length.

Hydrology

The Lower Wairau is low gradient, and historically lacked the capacity to carry design flood flows. The Wairau Diversion was constructed in 1963 to add capacity to the lower river system. A flow split just below SH1 is managed by engineering works. Low flows are split approximately 50-50, to maintain water quality in both reaches as much as possible. Flows during small floods are primarily directed down the original Wairau channel by a low erodible bank to prevent the siltation which was been occurring in this reach following the construction of the Wairau Diversion. Once this bank overtops and erodes at about a medium fresh level (about every 10 months on average) the Wairau Diversion takes up to 55% of the high flood flows, keeping flows down the Lower Wairau channel within its safe capacity.

Flow records

There are water level recording sites in each channel, but these are only rated for flow at higher levels, low flow records are not possible because of the tidal nature of the lower river. Therefore low flow statistics, or even mean flows are not able to be derived. Because of the artificially managed nature of the flow split, records from the main Wairau River recorder, just upstream of the SH1 bridge cannot be used to determine the natural flow characteristics of the lower river reaches. Manual gaugings are carried out from time to time to ensure that the desired flows are being maintained in each channel.

Plan provisions

The Wairau catchment is covered by the WARMP, as set out in the introductory section on the Wairau catchment. A SFR on the main stem at the SH1 bridge gives some protection to flows in the lower river. The desired flow split mentioned above is part of the Wairau Rivers Floodway Management Plan.

Current level of allocation

There are no allocation limits specifically for the lower Wairau River. There are no significant consents issued from the Lower Wairau River reaches, with users preferring the better quality water available from adjacent groundwater.

Water quality

Apart from flood management, the biggest issues in the Lower Wairau are siltation, and water quality during periods of low flow. Managing low flows, and ensuring freshes are available to provide sediment transport through the lower reaches requires ongoing engineering intervention. Coastal processes form a bar across the mouth to the sea, meaning water quality in the lower river can be affected by a saline wedge, underlying the fresh water layer, as well as adversely affecting drainage in the Lower Wairau area. Forcing the water down the lower Wairau channel, and occasional engineering works at the Wairau Bar are both necessary to prevent this.

Future allocation

No obvious demands exist for river water in this reach. Small takes could be accommodated from low flows without any adverse effect on the river, as in the lower reaches the issue is more about water levels, rather than flows, and these are controlled by coastal and tidal influences. However if large quantities were proposed to be taken from the lower river, water quality could be at risk. There is no specific protection for this reach to prevent this occurring.

Summary of current status

- The Lower Wairau River has no specific SFR, or allocation limits which would provide useful environmental protection for the river in the event of large volume take proposals.
- There is no protection by way of SFRs, or allocation limits for the lower reaches of the river. The preference in this area is to use groundwater which is readily accessible, and of better quality, means there is no obvious or present threat to the reach.
- The safe yield of the river in this reach is unknown.

6.2.2. Wairau River Main Stem SH1 to Waihopai Confluence

Reach description

This reach of the Wairau River is about 20 km long, and is fully stopbanked on the southern side to protect the highly productive and populated Wairau Plain. On the northern side some lengths are stopbanked, other parts have little land requiring protection due to the closely adjacent northern hills.

Hydrology

This reach is notable as being the recharge zone for the main Wairau aquifer, which underlies the Wairau Plain to the south. In normal flow conditions between 7 and 9 m^3/s of river water is lost to the aquifer, over a distance of about 15 km. Consequently the lower end of this reach is the critical point for protection of low flows. A number of low flow gauging runs have been carried out over the years to determine flow loss profiles through this reach. Unfortunately since the commissioning of the Branch HEP scheme in 1984, with it's consequent hydro peaking effects, these low flow gauging runs are only possible when the HEP scheme is shut down for a period in excess of 24 hours during low flow conditions, a situation which does not happen often. Further investigations relating to flow losses are therefore difficult, and Council has to rely on information collected during the 1960's and 1970's. Arrangements are being made with TrustPower as part of the new Wairau consent for shutdown periods when gaugings can be carried out.

Flow records

The lower end of the reach is well represented by the flow records from the Wairau at Tua Marina site as detailed earlier. For other parts of the reach adjustment needs to be made using the observed flow loss profile.

Plan provision

The Wairau catchment is covered by the WARMP, as set out in the introductory section on the Wairau catchment. The SFR on the main stem at the SH1 bridge gives protection to flows in this reach, which for environmental and recreational purposes is one of the most important in the district.

Current level of allocation

There are no significant consents issued from this reach of the Wairau River, with users preferring the more reliable and better quality water available from adjacent groundwater.

Aquifer recharge protection

Although the losses during low flow conditions are significant, recent studies suggest regular freshes of 100 m^3/s or more are necessary to boost the Wairau aquifer levels, and that under a sustained low flow regime levels in the Wairau aquifer would continue to decline. This raises the question as to whether there should be provisions to ensure that freshes continue down the river, to protect the aquifer recharge, which is vital to the continued prosperity of the Wairau Plain. With the exception of major high flow takes to storage, or further HEP scheme development it is unlikely that class C could reach a level which would affect the frequency of small freshes. However it may still be wise to put policy in place for all main stem reaches to protect flow variability in this reach, to protect the aquifer.

Future allocation

While Wairau class B allocation is still available, users in this reach prefer to take groundwater. At this stage there is no great demand for the remaining surface water from this reach.

Summary of current status

- This reach of the Wairau River has an SFR which gives protection to this important resource.
- Measures to prevent flat lining of flows in the 60-300 m^3/s range may be necessary to protect aquifer recharge.

6.2.3. Wairau River - Narrows to Wash Bridge

Reach description

The reach is approximately 55km long, from a point known as The Narrows, just above the Waihopai River confluence, to the Wash Bridge. It is a braided alluvial reach, which gains flow down its length from tributary inputs on both the north and south banks.

This section of the main stem is considered separately for two reasons; firstly there are particular requirements in the WARMP relating to this reach, and secondly because this reach has been the subject of intense debate during the TrustPower Wairau consent application, which has resulted in specific conditions which will significantly affect how water can be allocated from this reach in future.

Hydrology

The reach gains flow from tributaries on both banks, the largest being the Branch River on the southern side. However the majority of base flow inputs come from the high rainfall area of the Northbank, where a number of streams increase the summer low flows by about 50%. The hydrology of the reach was the subject of intense study during the TrustPower hearing, and there is a fairly good understanding of the flow profile as a result of this. However the exposure of the Northbank Hills to large north-westerly rain events means that there is always some variability of contribution from these sources.

Flow records

There are no flow recording sites within this reach. Good low – medium flow relationships have been derived between Councils Tuamarina site, and the Narrows, and between NIWA's Dip Flat site, and the Wash Bridge. However the relationship between the Narrows, and Wash Bridge is not as well defined; this just serves to illustrate the variability of the inputs within this reach. The following data for Narrows, and Wash bridge has been taken from the TrustPower evidence;

	Wairau at Wash Bridge Derived data	**Wairau at Narrows Derived data**
Catchment area	730 km^2	2368 km^2
Mean flow	35 m^3/s	87 m^3/s
Minimum recorded flow	6.5 m^3/s	11 m^3/s
Mean annual low flow (7 day)	10 m^3/s	19 m^3/s

The increase in flow down the reach highlights the large increase in catchment area, as well as the significant contribution from the Northbank streams.

Plan provisions

The Wairau catchment is covered by the WARMP, as set out in the introductory section on the Wairau catchment. Two SFRs have been set for the main stem, one at the Narrows, and one lower down at the Tuamarina State Highway Bridge (SHB), either can be applied within this reach. The 30 m^3/s allocation limit for the Wairau River is the total for the entire Wairau length, and is not limited to any one reach.

Summary of WARMP SFR provisions for the Wairau River		
SFR flow	8.0 m^3/s at Tuamarina	(Proposed NES 10.7 m^3/s)
	14.0 m^3/s at The Narrows	(Proposed NES 16.3 m^3/s)

TrustPower Hydro Electric Power consent

TrustPower have been granted consent to divert water from the Wairau River at the upper end of this reach, and channel it via a series of canals through five power stations, to discharge back into the Wairau River near the lower end of the reach, just above the Narrows.

Under the TrustPower consent there are minimum flows required to be maintained immediately below the intake, and above the outlet of the scheme. These essentially form another level of protection for this reach of the river, and arguably provide greater low flow protection than that afforded by the 14 m^3/s SFR set at the Narrows by the WARMP. However balanced against this is the reduction in flow variability, and the percentage of time which the river may be flowing at these minimum flows. The TrustPower conditions require the following minimum residual flows;

Month	Minimum residual flow at Intake	Minimum flow upstream of scheme discharge point
January - July	10 m^3/s	15 m^3/s
August	12 m^3/s	17 m^3/s
September	15 m^3/s	20 m^3/s
October - November	20 m^3/s	25 m^3/s
December	15 m^3/s	20 m^3/s

This consent is specifically outside the class allocation regime; however it still has a potential effect on the requirements for any new consent in this reach, as any class B and C allocation in the reach can derogate the TrustPower consent. Therefore TrustPower are an affected party in any future consent applied for between their intake and outlet points. Despite commencement of construction having been put on hold indefinitely, the TrustPower consent is still current, and as it has a lapse date of 2021 must still be considered to be a valid allocation. This has implications for future allocations within this reach, and will be the subject of a separate report.

If the complex range of minimum flows resulting from the TrustPower consent process is an indication of the views of the community, then it may be that the SFR requirements for this reach of the river (and perhaps even other reaches) needs to be reviewed.

Current level of allocation

The majority of Wairau class B consents are located in this reach of the river, probably because it does not have the reliable groundwater resource which the lower reaches do, and irrigable land is generally closer to the river. Note that for allocation purposes groundwater abstractions near the river are considered to be river takes, and are allocated as Wairau class B consents.

Future allocation

There is still Wairau class B allocation available, however all of the land on the south bank of the Wairau has sufficient water under existing consents, as does the majority of land on the Northbank of the river. As mentioned earlier in section 6.2 there could conceivably be demand to take water from this reach via canal to water short areas or storage dams further down the catchment.

Summary of current status

- This reach of the Wairau River has a SFR which gives protection to this resource, as well as additional provisions under the TrustPower consent.
- Most of the adjacent land has existing consents, and further demand is likely to be limited, with the exception of possible out of zone requirements.

6.3. Wairau River Tributaries

6.3.1. Wairau Plains

Catchment description

The Wairau Plains and the hill catchments which feed them cover an area of approximately 630 km^2. The hill catchments comprise a number of valleys, including the Taylor River, Doctors Creek, Fairhall River, Mill Stream, and Omaka River, collectively know as the Southern Valleys. The rounded landforms of the front hills change to steeper county behind, rising to about 1600 m at the head of the Omaka catchment.

All of these streams are intermittent, generally losing summer flow once they exit the confines of the hills.

The flat land of the Wairau Plain is the most productive land in Marlborough, with spring fed streams, and numerous aquifers historically supplying water for numerous agricultural activities. In recent years this area has become dominated by viticulture.

Rainfall and climate

The climate on the plains suits a variety of crops, and various monitoring data are available from sites operated by MetService, and other agencies. Rainfall ranges from 600 mm near the coast, to about 800 mm in the hill country. Council operates six rainfall recording sites on the plain, and in the southern hill country.

Hydrology and flow records

As discussed earlier, most of the larger rivers and streams are perennial in their upper reaches, but are flow intermittently in their lower reaches as they lose flow to groundwater as they exit the confines of the hills. Numerous spring fed streams sourced from the Wairau aquifer rise on the Wairau Plain. The largest of these is Spring Creek, which accounts for about 50% of the water lost to the Wairau Aquifer from the Wairau River.

Council operates flow recording site on The Taylor River, Omaka River, and has an intensive programme of manual measurement of the spring fed streams. In addition various investigations in the past can be used to co-relate the many stream flow gaugings against the permanent recording sites.

Basic flow statistics are as set out below;

	Taylor River at Borough Weir (record begins 1979)	**Omaka River at Tyntesfield Gorge (record begins 2006)**	**Spring Creek at Motor Camp (record begins 1977)**
Catchment area	69 km^2	90 km^2	Spring fed
Mean flow	0.680 m^3/s	1.138 m^3/s	~4.0 m^3/s
Minimum recorded flow	0.005 m^3/s	0.067 m^3/s	2.9 m^3/s
Maximum recorded flow	197 m^3/s	285 m^3/s	N/A
Mean annual low flow (7 day)	0.032 m^3/s	0.141 m^3/s	~3.3 m^3/s

Note: figures for Spring Creek are estimates as record is not continuous.

Plan provisions

The Wairau Plain and Southern Valleys catchments are covered by the WARMP. There are no SFRs or allocation limits in the plan for any south bank tributaries, and therefore no protection for these water bodies.

The key issues in the area relate to protecting the groundwater resource which is reliant in part on the recharge from southern hill catchments. These are covered by allocation limits in the groundwater section of the WARMP, however for most aquifers this allocation limit has been exceeded.

Southern Valleys issues

The Southern Valleys catchments are managed to protect the groundwater resource; the few surface water takes from low flows are accounted for as part of the groundwater allocation. There are a number of consented surface water takes which have thresholds set which allow taking of water to storage dams at higher flows, without compromising aquifer recharge.

Wairau Plain issues

The spring fed streams on the Wairau Plain are valued by many for their visual value and their aquatic habitat. They are also a measure of aquifer status. Protection of the spring fed streams is an issue which needs ongoing discussion.

The flows in spring fed streams can be affected by abstraction from the adjacent aquifer. The degree of effect is dependant on aquifer characteristics, and the separation distance. Protection of spring fed streams is discussed in more detail in the groundwater report produced by Councils Groundwater Scientist.

Future allocation

At this stage the majority of the Wairau Plain is well served by the current consents. However it should be noted that this is mainly at application rates applicable to viticulture. Should different types of agriculture with higher application rates wish to establish on the Wairau Plain, then demand could increase.

There are some areas of the Southern valleys, particularly in the Omaka River Valley catchment area, where there is land without adequate water. Various water transport and/or storage proposals are possible to cover this shortfall in the future.

Summary of current status

- There are no SFRs set for any of the Southern Valley streams; these have no direct environmental protection under the WARMP.
- The safe yields of the Southern Valleys streams are not known. In order to protect the important groundwater recharge function, direct surface takes are generally limited to high flow takes only.

6.3.2. Waihopai River

Catchment description

The Waihopai River catchment covers about 790 km^2, which is 7% of the total Marlborough District. It is one of the major tributaries of the Wairau River. Its upper catchment is mountainous, with many peaks over 2000 metres. Much of the river is deeply incised in greywacke bedrock, however there are alluvial reaches in the upper catchment, and at the lower end it widens out to an alluvial valley. Generally the river gains flow down its entire length, although there are some apparent losses to groundwater in the lower 10 km.

Rainfall and climate

The catchment receives varying rainfall, from around 800 mm annually in the lower catchment to over 1500 mm in the upper catchment. While somewhat sheltered from smaller north and west rain events by the higher mountain ranges further inland, it is still prone to significant rain in more major events, and can be a major contributor to Wairau floods. The lower valley has areas suited to viticulture; however these can be frost prone. Council operates two rainfall sites in the catchment, one at the Craiglochart river recorder, and one at the Spray River confluence, about 35 km up the valley.

Flow records

Council operates a flow recording site at Craiglochart, about 12 km up the valley, from which over 50 years of useful record is available. Basic flow statistics are as set out below:

Waihopai at Craiglochart	**(record begins 1960)**
Catchment area	744 km^2
Mean flow	14.9 m^3/s
Minimum recorded flow	1.00 m^3/s
Maximum recorded flow	1074 m^3/s
Mean annual low flow (7 day)	2.7 m^3/s

As the recording site is close to the lower end of the valley, and there are no major tributary inputs below this, for the purposes of this report the available flow record is representative of the entire catchment. Some minor losses to groundwater have been recorded in the lower 5 km of the river.

Gibsons Creek

Near the lower end of the river an off take diverts water into the Gibsons Creek rewatering channel, which provides stock water, irrigation water, and groundwater recharge for otherwise water short areas of the upper Wairau Plain. The volume of water available from the Waihopai has since been supplemented with additional water diverted from the Wairau. In the early days of Gibsons Creek operation the flow diversion was operated to the detriment of flows down the final 2 km length of the Waihopai River to the Wairau confluence. However in recent decades, and particularly with the construction of the new Wairau intake in 2004, this is no longer the case.

Benhopai power scheme

TrustPower operate a small scheme (capacity 2.4 MW, generating 11.8 GWH annually) from the Benhopai Dam, about 25 km up the catchment. This scheme was originally built by the local power company in the 1920s, and diverts water from the dam through a penstock, rejoining the river about 400 metres downstream. There are native fish passage issues associated with the operation of the dam; these are mitigated by provisions for fish transfer from below to above the dam. Most irrigation water takes are below the dam, and do not affect the availability of water for generation, however as the scheme is small, and relies on as much water as is available to be economic, TrustPower have submitted on any new takes above the dam. As long as this approach continues, there are unlikely to be any further allocations above this point.

Plan provisions

The Waihopai catchment is covered by the WARMP. A SFR has been set for the main stem of the river, along with allocation limits for classes A, B, and an open ended class C. However neither SFRs nor allocation limits have been set for any of the tributaries, where needed these have been done on a case by case basis. In addition to any specific conditions determined for a tributary stream, the appropriate class of Waihopai consent is included as an underlying condition to protect the flows in the main stem. As noted earlier, Waihopai allocations can potentially have an effect on flows in the Wairau River, but this is not recognised in the plan.

Summary of main WARMP allocation provisions for Waihopai River and tributaries	
SFR flow	1.35 m^3/s above Gibsons Creek Diversion (Proposed NES 2.43 m^3/s)
Class A allocation	0.25 m^3/s when flow is above 1.9 m^3/s at Craiglochart recorder, progressively reducing to 0 at flow of 1.5 m^3/s
Class B allocation	1.13 m^3/s when flow is above 3.6 m^3/s at Craiglochart recorder, progressively reducing to 0 at flow of 1.9 m^3/s
Class C allocation	67% of any flow in excess of 3.6 m^3/s at Craiglochart recorder, no upper limit
Gibsons Creek SFR	A minimum of 0.35 m^3/s of Waihopai flow is diverted into Gibsons Creek
Gibsons Creek Class A allocation	0.15 m^3/s when flow is above 1.9 m^3/s at Craiglochart recorder, progressively reducing to 0 at flow of 1.5 m^3/s

The SFR provisions ensure that a minimum flow of 1.35 m^3/s is maintained in the Waihopai River above the Gibsons Creek diversion off take; up to 0.35 m^3/s of this is then diverted down Gibsons Creek, leaving 1.00 m^3/s flowing down the last 2 km of the Waihopai River, to the Wairau confluence.

Reliability of allocation

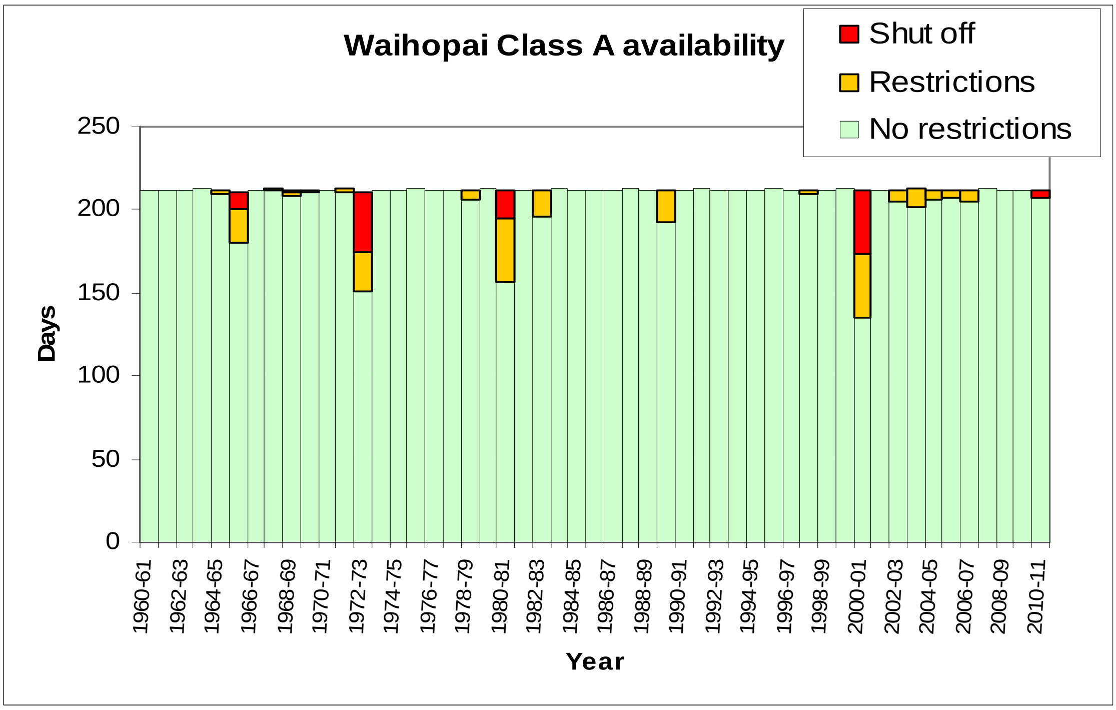
The reliability of an allocation class is an important factor for users to consider when applying for consent to use water. The following table shows the amount of time which each class of allocation is fully available for each month of the year. It can be seen that the Class A allocation is quite reliable, being fully available on average at least 93% of the time through the main irrigation months of January to March. However Class B is relatively unreliable through these months with the likelihood of restrictions or cutoffs being 40% of the time from January to April in an average year. Class C is not shown, its reliability is low, and depends on the level of allocation within the class. No reliability figures are shown for class C, as this is a variable threshold which is dependant on the volume of class C allocated (see section 5.2.1, class C upper limit).

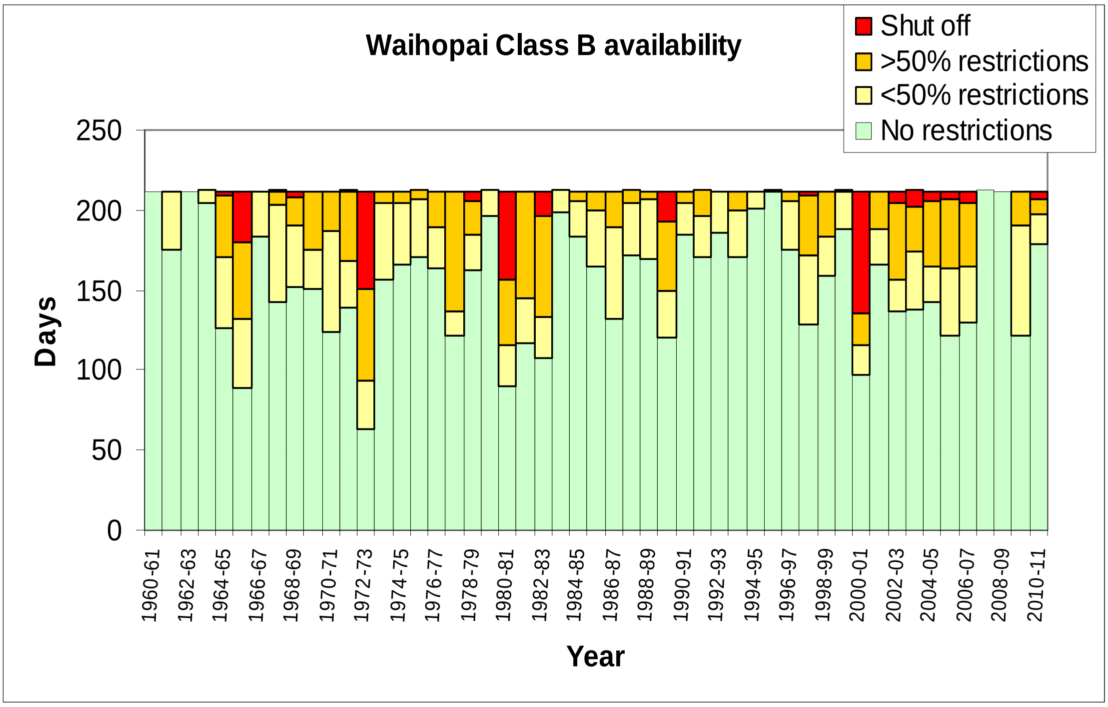
To date rationing has not been imposed on class B takes from the Waihopai River, even though this should have happened.

Waihopai River monthly reliability table (% of time allocation fully available)												
Availability	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
1.50 SFR	99	97	98	98	100	100	100	100	100	100	100	100
>1.9 (A)	98	93	94	95	99	100	100	100	100	99	100	99
>3.6 (B)	71	58	56	61	77	85	88	92	96	94	90	78

While the a significant portion of the irrigable area of the Waihopai Valley is currently covered by consented water takes, it needs to be remembered that 75% of the allocated water (discounting class C) is from the less reliable class B consent. This means that large areas of high value crops are at risk in some years if backup strategies are not in place.

The graphs below shows the number of days during each irrigation season (Oct-April incl) which the Waihopai River allocation would have been restricted or shut off (un-available) over the full length of the river record. The 1972-73, and 2000-01 drought events were major, and shutoffs would have been extensive, however at this time there was no significant irrigation from the Waihopai River. Unlike some Marlborough rivers the Waihopai flow recording site is upstream of most irrigation takes, so is generally representative of the natural river flow.



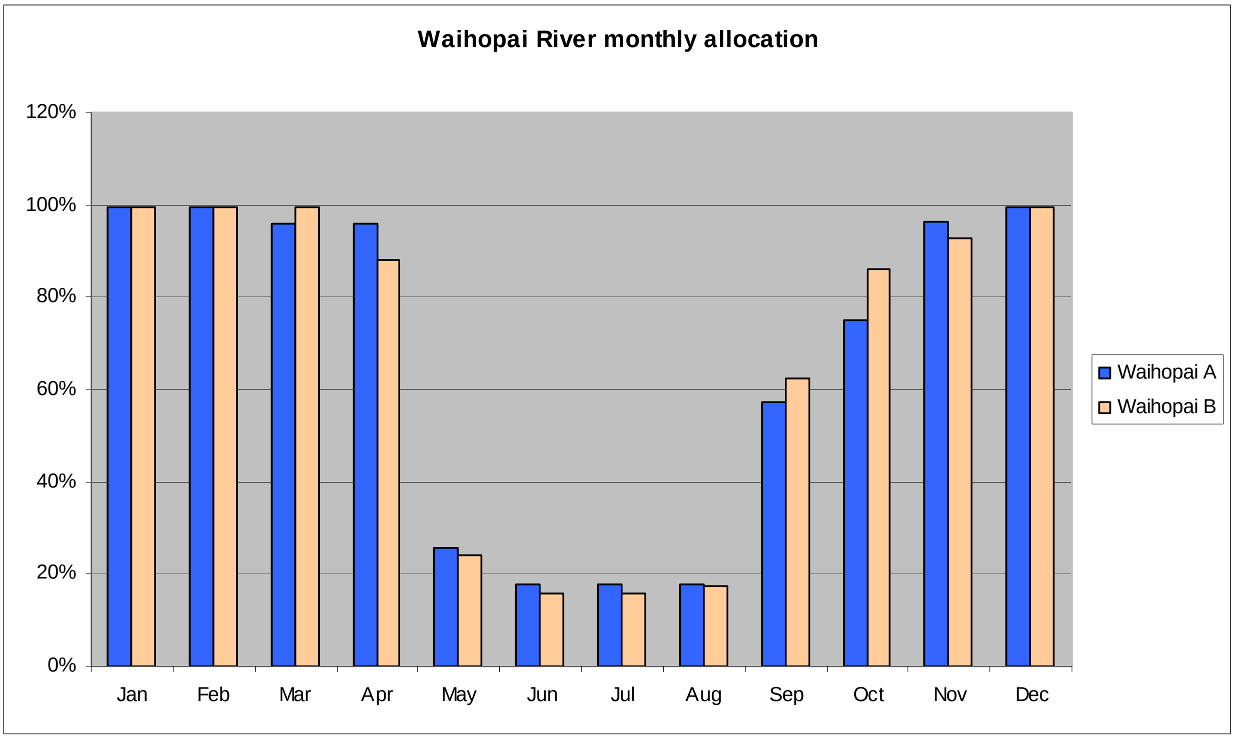


Current level of allocation

Both Class A and Class B are fully allocated during the irrigation season. The class C allocation is significant, with the risk of occurrence of the potential issues discussed earlier. Review of the unlimited nature of class C may be necessary in future.

Waihopai River Allocations		
	Allocation limit	**Total allocated**
Class A	0.25 m^3/s	0.25 m^3/s
Gibsons Class A	0.15 m^3/s	0.12 m^3/s
Class B	1.13 m^3/s	1.08 m^3/s
Class C	unlimited	2.66 m^3/s

The following graph shows the percentage allocation by month of class A and class B, illustrating the peak seasonal requirement during the months of December to February inclusive.



Tributaries and upper reaches

There are no SFRs for any tributaries, or even the upper reaches of the main stem, where flows are significantly lower, and therefore no protection for these flows, other than the underlying Waihopai class consent which is applied to all Waihopai tributary consents. Any applications are considered on a case by case basis.

Likewise there is no allocation limit specifically for tributaries; again, consents are limited by the Waihopai class allocation limits.

Future allocation

There is still some irrigable land adjacent to the Waihopai River which could be developed for a variety of uses, depending on economics at the time. A community scheme was proposed in the Lower Waihopai/Omaka River Valley area in the 1990s, however this did not proceed. Since then much of the land in the command area for that scheme has since gained access to water from other sources; however there are still some areas remaining where the availability of more reliable water would benefit production.

Summary of current status

- The main stem of the Waihopai River has an SFR which gives protection to the lower reaches, but does not necessarily give protection to the upper reaches.
- There are no SFRs set for any of the many tributaries, these have no direct environmental protection under the WARMP.
- There are class A and B allocation limits for the main stem, which are applied so as to include any takes from tributary flows.
- Class A and B are fully allocated
- The plan rationing provisions have not been applied to class A and B to date; this could endanger the environmental sustainability of the resource.
- The unlimited Class C has a significant level of allocation, although utilisation is variable. If allocation were to continue this could cause sustainability and equity issues, both for the resource and for other class C users.
- The safe yield of the upper river and tributaries is unknown.

6.3.3. Southbank

Catchment description

The Southbank area of the Wairau River, generally known as Wairau Valley, comprises about 450 km^2 of moderate to steep hill country, with a strip of flat land about 2 km wide on the terraces adjacent to the river. Numerous small rivers and streams exit the side valleys, and cross the flats to enter the Wairau River. The biggest of these is the Wye River, with a catchment area of about 85 km^2.

Most of the smaller side streams lose flow once they exit the confines of the hills, sometimes re-emerging as springs further down the valley. In particular the series of springs which form the base flow of Mill Stream have been the subject of much study by Council, as the perennial flow of Mill Stream is highly regarded locally. The only other perennial stream which crosses the Wairau Valley flats is Walkers Stream, which is also spring fed in summer.

Rainfall and Climate

Rainfall is generally around 1000 mm on the valley floor, increasing to around 1200 mm in the higher country to the south. Council has a long term rainfall site in the middle of the Wye catchment, and has recently established a rainfall site at Mill Road, 3 km west of Wairau Valley Township.

Flow records

Council operates a flow recording site on Mill Stream, this recording site was established to monitor the flow of this spring fed stream, both for resource investigation purposes, and for monitoring the effects of several consents from or nearby the spring zone of the stream

Basic flow statistics are as set out below;

Mill Stream at Ormond	**(record begins 2003)**
Catchment area	Spring fed
Mean flow	0.423 m^3/s
Minimum recorded flow	0.139 m^3/s
Maximum recorded flow	3.0 m^3/s *
Mean annual low flow (7 day)	0.197 m^3/s
Note that the short length of record means that these figures may be not fully representative.	

The figures show a very reliable stream flow, particularly given the low number of perennial streams on the Wairau Valley flats.

Plan provisions

The Wairau south bank catchments are covered by the WARMP. There are no SFRs or allocation limits in the plan for any south bank tributaries, and therefore no protection for these water bodies.

Most rivers and streams, including the larger catchments such as the Wye River, Boundary Creek, Hillersden Stream, and Marchburn Stream do not flow over their full length in a normal summer, with most losing surface flow about where they exit the confines of the hills. As such SFRs and allocation limits for the few applications which have been considered have been set using a limited amount of data.

TrustPower conditions

As part of the resource consent conditions for their proposed Wairau HEP scheme, TrustPower are required to maintain minimum flows in the Wairau River at the Narrows. Any subsequent water allocation in the TrustPower reach could jeopardise the minimum flow at this point, and accordingly TrustPower have sought additional conditions to protect their interests. On the south bank of the Wairau these generally require that once the TrustPower scheme is established these consent holders will be required to take their water as part of the WVWES consent, and any other consent will be surrendered. TrustPower recognise the priority of those consents which predate the notification of their application, and do not seek additional conditions upon replacement of those consents.

Current level of allocation

Most irrigation consents in the area are taken from the Wairau River, or from gallery intakes near the river, which are treated as takes from the river. There are several consents associated with Mill Stream, either from surface water, or its associated groundwater. This is being allocated on a stacked basis, with cut-off thresholds being set progressively higher for each subsequent consent. An ad hoc SFR of 0.20 m^3/s has been set for the stream during resource consent processes. All consents in the area, with the exception of a few very small groundwater consents, have Wairau class B conditions as underlying protection.

A consent to divert water from Mill Stream for aquaculture affects a length of about 400 m of the stream before flow is returned to the stream, a specific SFR is in place for this consent to protect fish passage and habitat.

Tributaries and upper reaches

Future allocation

As mentioned previously this area is well served by existing consents from the Wairau River. Some rationalisation will be required when the WVWES consent is exercised, and future demand could also be affected by change in land use.

Summary of current status

- There are no SFRs set for any of the many tributaries, these have no direct environmental protection under the WARMP.
- The safe yields of the streams, including (and especially) the groundwater resource associated with Mill Stream is unknown.

6.3.4. Branch River

Catchment description

The Branch River catchment covers about 560 km^2, which is 5% of the total Marlborough District. It is one of the major tributaries of the Wairau River. Its upper catchment is mountainous, with many peaks over 2000 metres. About 6 km up the river it splits into two major sub catchments, the Branch, and Leatham Rivers. Most of the river bed is contained within steep hills, although there are some wider alluvial reaches. The river gains flow down its entire length.

Rainfall and climate

The catchment receives varying rainfall, from around 1200 mm annually in the lower catchment to over 2000 mm in the upper catchment. It is exposed to rain events from the north and west directions, and these events can be significant. The Branch River is a major contributor to Wairau floods, and is also a useful contributor to Wairau low flows. Council operates a rainfall site in the lower reaches of the catchment at the Branch river recorder.

Flow records

Council operates a flow recording site at the TrustPower HEP weir, about 3 km up the valley, from which over 50 years of record is available. However changes in the recorder site mean that a single flow record is not available, and flow statistics may not be completely representative. In particular no maximum flow is listed below* because of issues regarding the high stage rating at the site. Basic flow statistics are as set out below;

Branch at Weir	(record begins 1958)
Catchment area	550 km^2
Mean flow	13.9 m^3/s
Minimum recorded flow	3.1 m^3/s
Maximum recorded flow	*
Mean annual low flow (7 day)	4.1 m^3/s

As the recording site is close to the lower end of the valley, and there are no major tributary inputs below this, for the purposes of this report the available flow record is representative of the entire catchment. Several low flow gauging runs have been carried out in the Branch catchment, so main stem and tributary flows can be estimated at various points of the catchment as required.

TrustPower Branch hydro electric power scheme

TrustPower operate a HEP scheme (capacity 11MW, generating 54.3 GWH annually) on the Branch River, diverting water via a weir structure about 3 km up the river, into a short canal, which feeds into a man made lake (Lake Argyle) which holds approximately 500,000 m^3. From here power is generated through the Argyle Power House, and continues through another 3 km of canal to the larger Wairau power house, before discharging to the Wairau River approximately 7 km below the Branch-Wairau confluence.

There are fish passage issues associated with the operation of the intake weir; these are mitigated by provisions of a fish ladder, and elver pass from below to above the dam, although the effectiveness of the operation of these is often debated. Restocking of the upper reaches of the river with trout from other areas is also carried out as part of an agreement with Fish and Game.

The consented abstraction for the scheme is 30 m^3/s, double the mean flow of the river. This means inflow into the scheme is often below full generation capacity, and as a result during low flow periods water is pulsed from Lake Argyle, once, or twice daily to coincide with peak daily power demand. The resulting pulses of water discharging into the Wairau River cause flow fluctuations (known as hydro peaking) which are obvious at Councils Tuamarina recorder, some 65 km downstream. Issues regarding these fluctuations are discussed separately in the Wairau sections of this report.

There are no water takes consented above the intake weir. Any proposed consumptive take above the weir it would adversely affect the TrustPower consent, and would probably be opposed by them as a result.

Plan provisions

The Branch catchment is covered by the WARMP. A SFR has been set for the main stem of the river below the intake weir, however no allocation limits have been set. Neither SFRs nor allocation limits have been set for any of the tributaries, where needed these have been done on a case by case basis.

Summary of main WARMP SFR provisions for Branch River and tributaries		
SFR flow downstream of Marlborough Electric Weir	1.0 m^3/s between 1 May and 31 December.	(Proposed NES 3.28 m^3/s)
	1.5 m^3/s between 1 January and 30 April.	(Proposed NES 3.28 m^3/s)

The SFR provisions are a matter of some debate, particularly as to whether the SFR is supposed to apply to the entire length of the Branch River, or simply at a point immediately below the TrustPower intake. As all other SFR conditions included in the plan apply at a point, rather than over a reach, it is suggested that this is also the case for the Branch River.

TrustPower residual flows

The TrustPower consent (U990161) conditions mirror the SFRs above, and clearly state that these flows must be released from the fish pass; there is no requirement specified for minimum flows to be maintained further down the river. At times there are flow losses down the length of the Branch River resulting in flows in the lower reaches being less than those released; this has caused debate over the adequacy on the residual flow/SFR requirements. This has been the subject of recent field investigations, and will be addressed further in a separate report on Environmental Flow requirements.

Current level of allocation

There are no allocation limits from the Branch River, and apart from the TrustPower HEP abstraction, there are no other allocations from the river. There is one small irrigation consent issued from Lake Argyle to supply the land through which the canal passes.

A consent to operate a salmon farm, using a diversion from the river has now lapsed.

Tributaries and upper reaches

There are no SFRs for any tributaries, or even the upper reaches of the main stem, where flows are significantly lower, and therefore no protection for these flows. Likewise there is no allocation limit specifically for tributaries.

Future allocation

There are small areas of land adjacent to the Branch River which could be developed for irrigated pastoral or dairy farming, depending on economics at the time; climate is likely to be a limiting factor for most other uses.

Summary of current status – Branch River

- The Branch River has an SFR, although there is disagreement whether that SFR provides suitable environmental protection for the lower reaches of the river.
- There are no SFRs set for any of the many tributaries, these have no direct environmental protection under the WARMP.
- There are no abstraction limits for the main stem, or any tributary flows.
- The safe yield of the river above the HEP weir is unknown.
- While there is no protection by way of SFRs, or allocation limits for most of the catchment, any future consent application is likely to be contested by TrustPower, to protect their interests.

6.3.5. Upper Wairau River catchment

Catchment description

From the Wash Bridge, to its headwaters, the Upper Wairau area covers about 804 km^2, which is 8% of the total Marlborough District. It is a spectacular mountainous area, with peaks up to 2300 metres.

Rainfall and climate

The catchment receives varying rainfall, from around 1600 mm annually in the lower catchment to over 2000 mm in the upper catchment, although the maximum rainfall is unknown, as it is a sparsely populated area. It is exposed to rain events from the north and west directions, and these events can be significant. Snow covers the mountains for most of the winter, and this helps contribute good base flows to the Wairau River through spring and early summer.

Flow records

The winter snow cover, geology, and high rainfall mean that this section of the Wairau River gains flow down its entire length. The records show a reliable flow, with a high specific discharge. NIWA operate a flow recording site at Dip Flat, about 10 km up the river from the Wash Bridge. This has been operating since 1951, and is the longest flow record available in Marlborough. Basic flow statistics are as set out below;

Wairau at Dip Flat	Site 60114
Catchment area	505 km^2
Mean flow	26.9 m^3/s
Minimum recorded flow	5.4 m^3/s
Maximum recorded flow	626 m^3/s
Mean annual low flow (7 day)	8.6 m^3/s

A reliable low/medium flow relationship between Dip Flat and the Wash Bridge site was developed for the TrustPower Wairau consent hearing. Accordingly flows at Wash Bridge can be calculated if required. Several low flow gauging runs have also been carried out in the Upper Wairau, so main stem and tributary flows can be estimated at various points of the catchment as required.

Plan provisions

The Upper Wairau catchment is covered by the WARMP. No SFRs or allocation limits have been set for the main stem in this area, or for any of the tributaries. The WARMP rules for the Wairau main stem would apply, however these would provide little protection for the Upper Wairau reach. Any abstraction from the Wairau River and its tributaries upstream of the Branch confluence is a non complying activity

There is no SFR set in the WARMP for any of the Upper Wairau reach; the default NES Ecological Flow at Dip Flat would be 6.88 m^3/s.

Current level of allocation

There are no allocations from this reach of the river, other than a small water take for the Rainbow Ski field for snow making, and use at the ski field.

Future allocation

There are areas of land totalling several hundreds of hectares adjacent to the Upper Wairau River which could be developed for irrigated pastoral or dairy farming, depending on the economics at the time, although there may be climatic constraints to such development.

The TrustPower consent to take water for HEP generation about 7 km downstream of Wash Bridge would have an influence on any consumptive use applications in the Upper Wairau, as TrustPower would need to be considered to be an affected party, and are likely to oppose such applications.

Investigations into an Upper Wairau HEP scheme have been carried out in the past, and a small power scheme could still be feasible, given the reliable flows, and high gradient of the river. Such applications would need to be balanced against the high natural value of this area.

Summary of current status – Upper Wairau River

- The Upper Wairau River has no SFR, or allocation limits which would provide useful environmental protection for the river, or any of the many tributaries.
- HEP generation is a possible threat to the sustainability of the upper reaches.
- The safe yield of the river in this reach is unknown.

6.3.6. Northbank

Catchment description

The Northbank area of the Wairau River comprises the southern side of the Richmond Range, with a series of short, steep rivers and streams flowing down to join the Wairau River. These rivers and streams widen out at the bottom, forming a series of pocket like flats bounded on one side by the hills and on the other by the Wairau River. The major catchments flowing off the Northbank (from west to east) are; Goulter River, Top Valley Stream, Timms Creek, Pine Valley Stream, Bartletts Creek, Onamalutu River, Are Are Creek, Waikakaho River, and Tuamarina River. Most of these have relatively narrow valley floors, the exceptions being Are Are Creek, and the Tuamarina River which are lower gradient near their confluences with the Wairau.

Rainfall and climate

There is a significant north-south rainfall gradient from at least 1800 mm at the top of the Richmond Range, down to around 1200 mm at the base of the hills. The shading effect of the Richmond Range means that the climate can be very cold in winter.

This area is a major contributor to Wairau River floods, the high mountains (up to1750m) are exposed to north-west rain events from the Tasman Sea, and the short steep nature of the catchments means that runoff can be severe. Consequently rainfall in the area has been monitored for flood warning purposes for many years. Council has two long term rainfall sites on the Richmond Range, one at the saddle between the Onamalutu and Bartletts Creek catchments, and one on Top Valley Ridge, above Lake Chalice. More recently a site has been established on the Red Hills, as a joint venture with the Tasman District Council.

Flow records

Very few of the streams have reaches suitable for flow recording sites, and most of the records available are one off gaugings, usually in low flow conditions. Recently investigations by TrustPower as part of their Wairau HEP investigations have added considerably to the knowledge base of Northbank flows. Where necessary as part of resource consent investigations, targeted gaugings have been carried out to attempt to co-relate with other water resources, in order to determine appropriate SFRs, and allocation limits.

The area has high specific discharges, and high flood flows are generated during north-west rainfall events.

Council operates a flow recording site on the upper reaches of the Onamalutu River. This site has been difficult to maintain, and the record is of limited use at this stage, but is proving useful for flood prediction purposes.

Plan provisions

The Wairau Northbank catchments are covered by the WARMP. There are no SFRs or allocation limits in the plan for any Northbank tributaries, and therefore no protection for these water bodies. Various consents have been issued to take water from groundwater near some of the Northbank streams, and specific local conditions have been imposed to protect the resource where necessary. In particular consents in the Tuamarina, Waikakaho and Are Are Creek areas have had additional SFR conditions imposed by way of consent as set out below. However note these are not specified in the WARMP.

Existing ad hoc Northbank SFR figures	
Tuamarina River	0.100 m^3/s
Waikakaho River	0.080 m^3/s
Are Are Creek	0.080 m^3/s

Current level of allocation

Most irrigation consents in the area are taken from the Wairau River, or from gallery intakes near the river, these consents generally have Wairau class B SFR and allocation requirements, but no local conditions. In the Tuamarina and Are Are catchments consents have been stacked to give priority to the initial water consents, but there are no allocation limits. In the case of the Tuamarina River, the most recent consents have a reliability of about 35% during the key summer irrigation months of January to March. This low level of reliability highlights the problem with a continual stacking regime.

All consents in the area also have Wairau class B conditions as underlying protection.

TrustPower conditions

As part of the resource consent conditions for their proposed HEP scheme, TrustPower are required to maintain minimum flows in the Wairau River above their discharge point. Any subsequent water allocation in the TrustPower reach could jeopardise the minimum flow at this point, and accordingly TrustPower have sought additional conditions to protect their interests. On the Northbank of the Wairau these generally require that the consents must cease taking water when the flow is less than 16 m^3/s at the Narrows. This condition means that the affected consents will be less reliable once the TrustPower scheme is built. The level of reliability is hard to determine, as it depends on the accuracy of the TrustPower flow predictions, and the generating regime which they operate. However it is likely on average the affected consents will be required to shut off for about 30 days per year. This condition does not apply to any consent which predates the TrustPower decision.

Future allocation

Most of the Northbank area is now reasonably well served by water consents, with the exception of Are Are Creek where the local water resource is not sufficient to irrigate the adjacent land. The reliability of new consents in the TrustPower reach may be affected by any conditions necessary to protect the TrustPower consent.

Summary of current status

- There are no SFRs set for any of the many Northbank tributary streams; these have no direct environmental protection under the WARMP.
- The safe yields of the streams is unknown.
- There are no allocation limits for any of the streams, in some cases continued allocation means that the reliability of recent consents is very low.
- Where consents have been stacked there is no environmental flow share included.

6.4. Southern Marlborough Catchments

6.4.1. Awatere Valley

Catchment description

The Awatere catchment covers about 1620 km^2, which is 15% of the total Marlborough District. It is an elongated valley approximately 100 km long and 10-20 km wide, with numerous small steep tributaries. The upper reaches are bounded by high ranges on both sides. The lower reaches of the Awatere River are deeply incised into mudstone, creating distinctive cliffs. Because of the impermeable strata on each side of the river there are no economic groundwater resources connected to, or reliant on the river, other than those in the riparian margin. This means that the river gains down its entire length, and makes understanding the hydrology of the river much simpler than for some other Marlborough rivers.

Rainfall and climate

The narrow, elongated catchment, and high hills and ranges surrounding the Awatere Valley mean that much of the catchment is in a rain shadow. The result is that rainfall in the upper catchment is lower than that of the headwaters of adjacent catchments. Coastal areas receive about 650 mm, this increases to about 900 mm in the mid reaches, but drops again to about 700 mm at Molesworth, near the head of the valley. The slopes of the ranges may receive up to 1300 mm. Climate information from Molesworth show the extremes of climate which can be experienced in the upper valley, on average over 200 ground frosts are recorded each year. The lower valley near the coast is much more temperate, with a significant area suited to viticulture and cropping.

Flow records

Council operates a flow recording site at Awapiri, about 45 km up the valley, from which about 25 years of useful record are available. Basic flow statistics are as set out below;

Awatere at Awapiri	Site 60203
Catchment area	987 km^2
Mean flow	13.7 m^3/s
Minimum recorded flow	1.49 m^3/s
Maximum recorded flow	320 m^3/s
Mean annual low flow (7 day)	2.8 m^3/s

The additional tributary inputs between Awapiri and the Awatere Mouth (outlet to the sea) mean that a flow correction is necessary to derive flows at the Awatere Mouth. This is particularly necessary when considering Ecological flows. A low flow relationship between Awapiri and the Awatere Mouth derived in the 1980's is used for this purpose.

Plan provisions

The Awatere catchment is covered by the WARMP. A SFR has been set for the main stem of the river, along with allocation limits for classes A, B, and an open ended class C. However neither SFRs nor allocation limits have been set for any of the tributaries, where needed these have been done on a case by case basis. In addition to any specific conditions determined for a tributary stream, the appropriate class of Awatere consent is included as an underlying condition to protect the flows in the main stem. The taking of water from Awatere River tributaries is a non-complying activity.

Summary of main WARMP allocation provisions for Awatere River and tributaries	
SFR flow	2.00 m^3/s at Awatere River outlet to sea *(Proposed NES 2.94 m^3/s)*
Class A allocation	1.0 m^3/s when flow is above 2.3 m^3/s at Awapiri recorder, progressively reducing to 0 at flow of 1.45 m^3/s
Class B allocation	2.6 m^3/s when flow is above 5.6 m^3/s at Awapiri recorder, progressively reducing to 0 at flow of 2.3 m^3/s
Class C allocation	67% of any flow in excess of 5.6 m^3/s at Awapiri recorder, no upper limit

Reliability of allocation

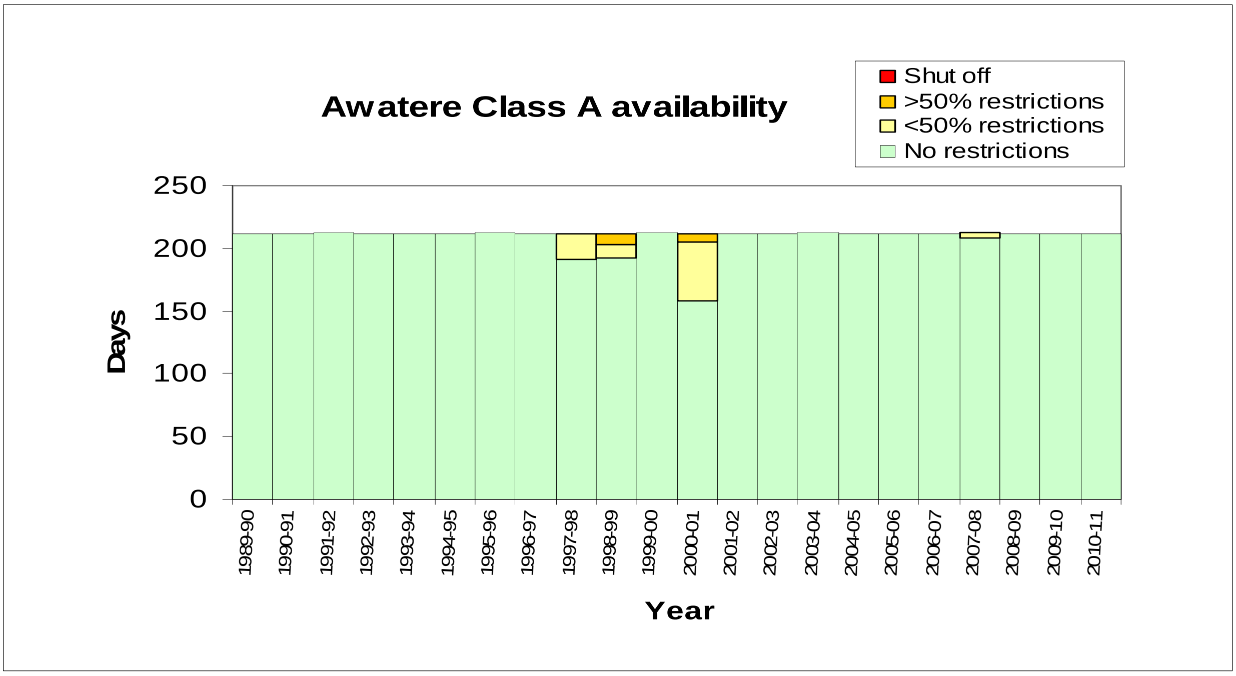
The reliability of an allocation class is an important factor for users to consider when applying for a consent to use water. The following table shows the amount of time which each class of allocation is fully available for each month of the year. It can be seen that the Class A allocation is quite reliable, being fully available on average at least 94% of the time through the main irrigation months of January to March. However Class B is relatively unreliable through these months with the likelihood of restrictions or cut-offs being necessary 50% of the time from January to April in an average year. Class C is not shown, its reliability is low, and depends on the level of allocation within the class.

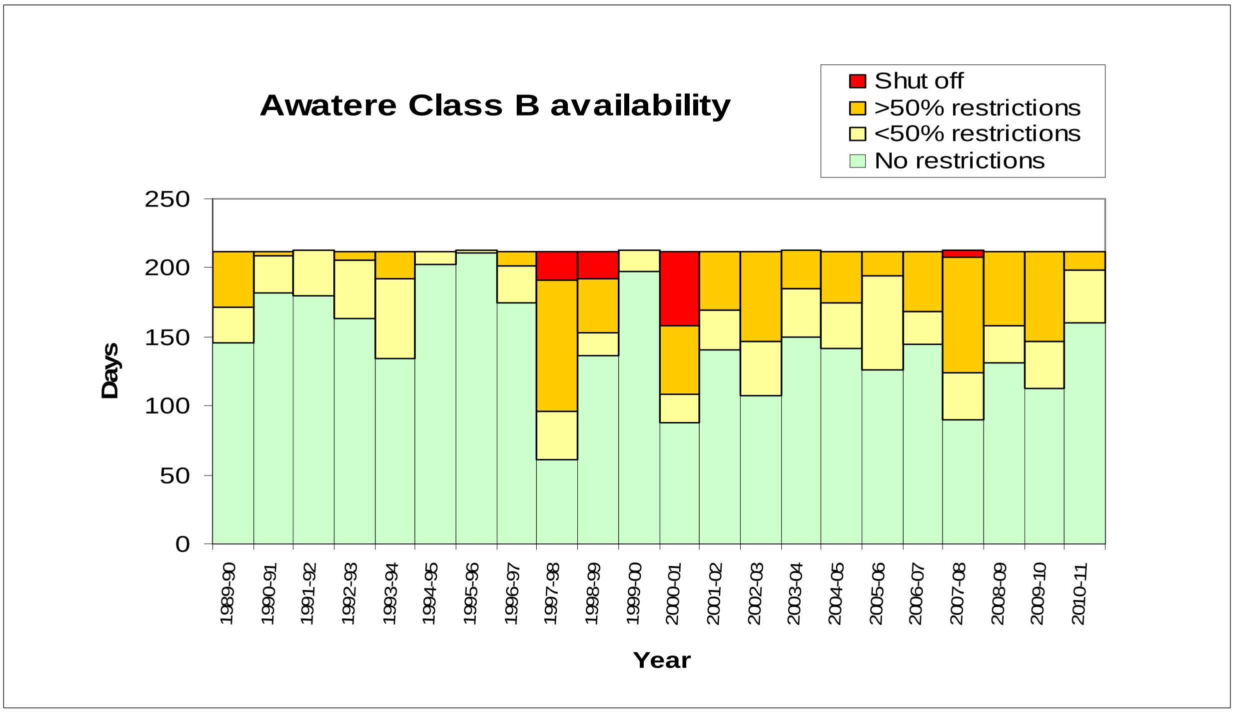
It should be noted that the reliability of class B is lower than was expected when the WARMP was developed. At that time limited hydrological data was available, but in the intervening 15 years considerably more data has been collected. This included a period of low rainfall, which means that the statistics derived from the flow dataset has changed significantly.

To date rationing has not been imposed on class B takes from the Awatere River, even though this should have happened.

Awatere River monthly reliability table (% of time allocation fully available)												
Availability	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
1.45 SFR	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
>2.3 (A)	98%	95%	94%	96%	99%	100%	100%	100%	100%	100%	100%	100%
>5.6 (B)	61%	48%	43%	47%	68%	76%	88%	92%	95%	99%	94%	82%

The graphs below shows the number of days during each irrigation season (Oct-April incl) which the Awatere River allocation would have been restricted or shut off (un-available) over the full length of the river record. The 2000-01 drought was a major event, and class B shutoffs would have been extensive, however at this time there was no significant class B irrigation from the Awatere River. Unlike some Marlborough rivers the Awatere flow recording site is upstream of all irrigation takes, so is representative of the natural river flow.





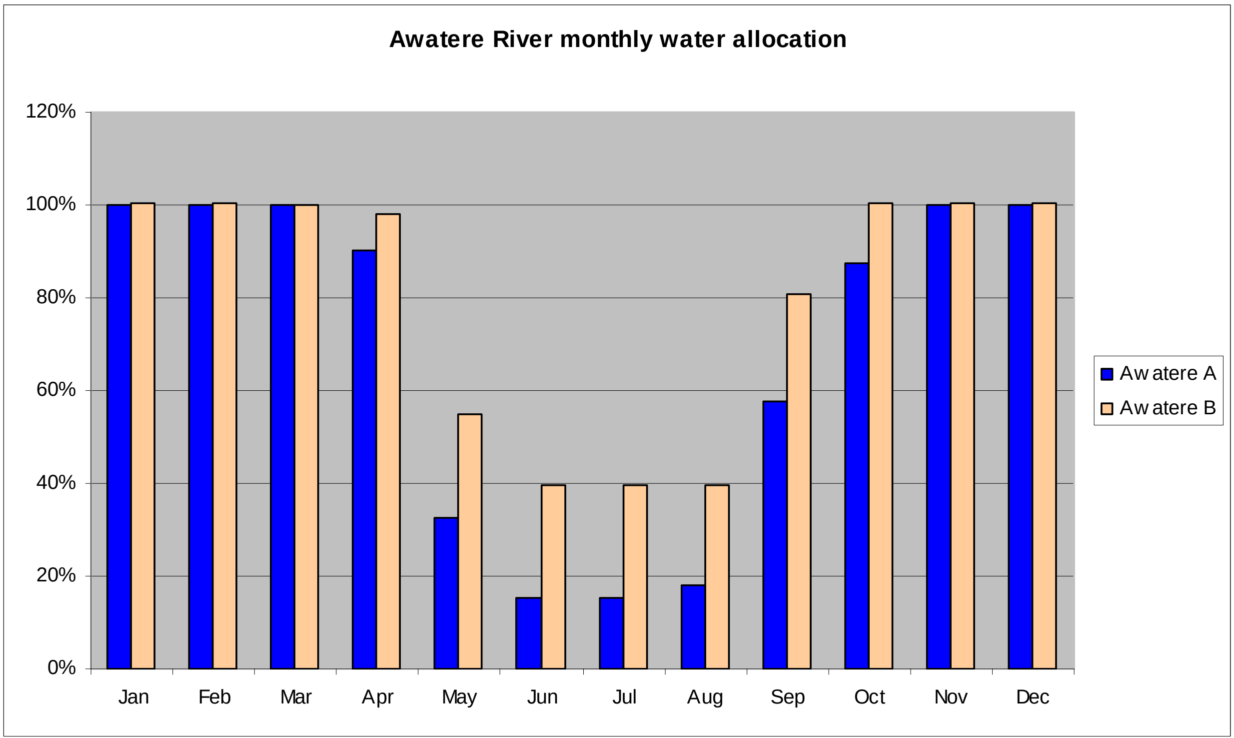
Current level of allocation

Both Class A and Class B are fully allocated. In general class B consents are considerably larger than class A consents, reflecting the larger scale of the more recent developments. Some of these larger consents are for group schemes to allow efficient taking of water to areas not immediately adjacent to the Awatere river. The class C allocation is starting to become significant, and review of this may be necessary in future.

In total about 10,000 ha of land is covered by irrigation consents, of this nearly 7000 ha is for viticulture, making the Awatere the second largest grape growing area in New Zealand, behind the Wairau Plain. These figures include the Blind River area, which although it is discussed separately in a subsequent section, sources much of its water from the Awatere River via the 1500 ha Blind River Irrigation Limited (BRIL) Scheme.

Awatere Allocations	Number of consents	Allocation limit	Total allocated	Allocation remaining
Class A	96	1.0 m^3/s	1.0 m^3/s	0
Class B	59	2.6 m^3/s	2.6 m^3/s	0
Class C	19	unlimited	2.646 m^3/s	unlimited

It should be noted that these allocations are not necessarily fully utilised, partly due to the seasonal nature of irrigation demand, and partly due to some consents being for developments which have not yet been completed. Given the present downturn in the wine industry, some of these consents may not be fully utilised within their existing term. The following graph shows the percentage allocation by month of class A and class B, illustrating the peak seasonal requirement during the months of November to March inclusive.



Future allocation

The Awatere Water Users Group (AWUG) has recently carried out a survey of irrigated and potentially irrigable land in the Awatere and Blind River catchments. This shows that there is still approximately 4000 ha of land which could still be developed for irrigated agriculture. Most of this land is some distance from the river, and some is in climatic zones which may significantly limit the types of crops which could be grown.

Other issues

One issue specific to the Awatere is the discolouration from suspended sediment, which occurs for prolonged periods. The fine nature of the sediment, which comes from the upper catchment, means that it stays in suspension for a long time, even at quite low flows. This makes it extremely difficult to remove using conventional filter systems. Consequently during the irrigation season the river water can be unsuitable for irrigation through drippers for prolonged periods, up to 80 days in some seasons.

In an average irrigation season water availability can be affected more by sediment than by shutoffs due to low flows.

Some users extract water via infiltration galleries which filter this sediment out, and allow them to continue irrigating during periods of moderate discolouration. The down side to this is that these galleries become blocked with the sediment which they are filtering, and regular maintenance of the gallery is necessary, usually involving works in the river with excavators, often at short notice.

Future requirements

While the majority of the irrigable area of the Awatere Valley is currently covered by consented water takes, it needs to be remembered that 73% of the allocated water (discounting class C allocations) is from the less reliable class B consents. This means that large areas of high value crops are at risk in some years unless backup strategies are in place. In addition turbidity issues during periods of higher flows can reduce the availability of water to some users even further.

Black Birch community supply scheme

The Awatere Valley community supply is taken from Black Birch Stream, a northern tributary of the Awatere River. This scheme supplies a population of about 1300 people, including the Seddon township, and provides the majority of the stock water in the Awatere and Blind River catchments. There is a high degree of reliance on this scheme by the local population, and while the scheme consent is considered to be within the allocation regime, there are no shutoff conditions on the consent.

Summary of current status

- The main stem of the Awatere River has an SFR which gives protection to the lower reaches, but does not necessarily give protection to the upper reaches.
- There are no SFRs set for any of the many tributaries, these have no direct environmental protection under the WARMP.
- There are class A and B allocation limits for the main stem, which are applied so as to include any takes from tributary flows, including the Black Birch Community scheme.
- Class A and B are fully allocated
- The plan rationing provisions are not applied to class A and B; this could endanger the environmental sustainability of the resource.
- The unlimited Class C has a moderate level of allocation, although utilisation is variable. If allocation were to continue this could cause sustainability and equity issues, both for the resource and for other class C users.
- The safe yield of the upper river and tributaries is unknown.

6.4.2. East Coast Catchments

Catchment description

The East Coast area covers an area of about 600 km^2, and incorporates a number of rivers and streams which flow directly into the sea. The three major catchments are the Blind River (100 km^2), Flaxbourne River (150 km^2), and the Waima (Ure) River (160 km^2), plus a number of smaller coastal catchments. The geology of the lower parts of the catchments consists of a relatively thin alluvial veneer, over a very thick, faulted mudstone basement.

Rainfall and climate

This is a dry coastal area, with annual rainfall typically in the 600 to 900 mm range. The coastal climate is generally mild, but the area is exposed to very high wind runs, resulting in high evapo-transpiration.

Hydrology

The combination of low rainfall, high evapo-transpiration, and mudstone geology results in interesting hydrological characteristics. Rainfall-runoff models generally predict base flows well in excess of what actually occurs. The lower reaches of most of the smaller streams including Blind River are ephemeral, and may only flow for a few months of the year. Only the lower Flaxbourne and Waima Rivers are perennial. The Waima tributaries are more reliable, as a result of different geology.

Flow records

Council operates a flow recording site at Corrie Downs, on the Flaxbourne River, from which 8 years of useful record are available. This means the data set is too short for confident analysis, however it is useful for co-relation against other nearby small catchments. Basic flow statistics are as set out below;

Flaxbourne at Corrie Downs	Record begins 2003
Catchment area	70 km^2
Mean flow	0.543 m^3/s
Minimum recorded flow	0.006 m^3/s
Maximum recorded flow	185 m^3/s
Mean annual low flow (7 day)	0.010 m^3/s

Short term flow records have also been collected on the Waima River by a local irrigation group. These have shown a reasonable degree of co-relation with the longer term Flaxbourne records, and have been used in support of a consent application from the Waima River.

Plan provisions

The East Coast catchments are covered by the WARMP. There are no SFRs or allocation limits set for any of the waterways, where needed these have been done on a case by case basis during the resource consent process.

There is specific protection for Lake Elterwater by means of a prohibited activity status for water abstractions for this resource. However somewhat paradoxically there are no rules regarding the streams which contribute to the lake and applications to take from these streams have been successful in the past.

Current and future levels of allocation

Due to the ephemeral nature of most of the streams, allocation in the area has been very complex, and often highly contested. General issues for each of the three main catchments are discussed below;

Blind River

Most of the abstractions on Blind River are for takes to storage. In some cases these abstractions are for off river dams, with smaller takes being pumped and larger takes by means of gravity channel. There are also a number of on stream dams on major tributaries of Blind River, which are subject to all the issues discussed in section 5.4.

As a result of the low reliability of water sources in the Blind River catchment, a community based company, Blind River Irrigation Limited (BRIL), have installed an irrigation water supply scheme, using class B water from the Awatere River. The scheme provides enough water for about 1500 ha at viticultural rates, and has had a high degree of uptake. Most of the participants in the scheme have installed on farm storage, to cover the lower level of reliability of the Awatere class B water allocation. This scheme has allowed the development of most of the suitable land in the Blind River area. However there are some small areas further up the catchment still seeking water, with an application for an on stream dam currently being processed.

Flaxbourne River

There is some direct irrigation from the lower reaches of the Flaxbourne River, and some takes to storage for subsequent irrigation. The landforms adjoining the Flaxbourne River are generally not suitable for smaller on stream dams, so all storage takes are to off stream dams. The Flaxbourne water resource has been highly contested over the years, with a complicated stacking regime as a result. Issues in the area are ongoing, with current consent applications being opposed by numerous parties. There is also competition for water allocation from Needles Creek, and Tachalls Creek, which are tributaries of the Flaxbourne River.

A community based solution is being investigated, with pre feasibility studies currently being undertaken. Possible options could include better use of the existing Flaxbourne resource by constructing large storage dam, and/or transporting water from another nearby catchment. Such a scheme would require widespread community support to be successful.

There are also two community based schemes for stock and domestic water in the area, both take water from gravels immediately adjacent to the Flaxbourne River. These schemes have no SFR requirements.

Waima (Ure) River

The Waima is the biggest catchment, and has the greatest water resource of these East Coast catchments. Ironically it has the least amount of suitable land for irrigated agriculture. Several consents have been issued for irrigation of pasture and viticulture, with no observed adverse effects on the resource.

The Waima River has been assessed as having potential to supply water for transport to the Ward/Flaxbourne area, 10 km to the north. A community based company, Flaxbourne Community Irrigation Ltd, currently hold consent to abstract 0.52 m^3/s from the Waima River, and use it for irrigation around Ward. Whether the scheme proceeds in this form will depend on the economics over the next few years.

Summary of current status

- There are no SFRs or allocation limits set for any of the East Coast water resources, these have no direct environmental protection under the WARMP.
- The safe yield of most rivers and streams is unknown.

6.4.3. Clarence and Acheron Rivers

Catchment description

While only part of the Clarence River catchment lies within the Marlborough District, it comprises a large part (15%) of the district. Of the total Clarence catchment of 3300 km^2, nearly half (1570 km^2) of the mid Clarence reaches, including the whole of the Acheron catchment (823 km^2), is included in the Marlborough District. The upper and lower Clarence are within the Canterbury region, and the two regions share a complex boundary, in one case the river centreline is the boundary. It is a lowly populated, remote and challenging area, bounded by mountain ranges up to 2300 metres high. There are several highly valued water features in the area, including Lake McRae, and the Tarndale Lakes (Lake Sedgemere, Bowscale Tarn, Fish Lake, and Island Lake)

Rainfall and climate

There is not a lot of rainfall information available in the catchment, but annual rainfall is generally between 1400 mm and 1600 mm, with some higher rainfall areas on the slopes of the Seaward Kaikoura ranges which are closer to the coast. The climate can be hot in summer, but very cold in winter. Climate information from Molesworth, in the upper Awatere Valley will give some indication of the climate.

Flow records

There are two flow recording stations which are relevant, the Acheron at Clarence confluence, and the Clarence at Jollies, which although it is in the Canterbury region, is just upstream of the Acheron confluence, and therefore relevant to the mid reaches of the Clarence, which are within the Marlborough District. Both are operated by NIWA, and the basic flow statistics for the sites are set out below;

	Acheron at Clarence confluence (record begins 1958)	**Clarence at Jollies (record begins 1958)**
Catchment area	973 km^2	440 km^2
Mean flow	23.1 m^3/s	14.6 m^3/s
Minimum recorded flow	2.16 m^3/s	1.67 m^3/s
Maximum recorded flow	1000 m^3/s	436 m^3/s
Mean annual low flow (7 day)	4.28 m^3/s	3.15 m^3/s

Plan provisions

The Clarence catchment is covered by the WARMP. No SFRs or allocation limits have been set at this stage, but in general these would be expected to follow the policies set out in Volume 1 of the WARMP. One specific requirement is that Lake McRae and the Tarndale Lakes have a high degree of protection through prohibited activity status for most water related activities.

Current level of allocation

There are currently no consents active in the Marlborough part of the Clarence catchment. It is not known if there are any consents in the parts of the catchment within the Canterbury region (upper Clarence above Acheron, and lower Clarence). In general climate and soils are not suitable for irrigated agriculture, with the possible exception of the coastal flats.

Future allocation

At this stage large scale demand for irrigation water is seen as being unlikely, except perhaps for the coastal river flats. However demand for water allocation could come from Hydro Electric power generation, as the narrowness of the valley, and the steep gradient of the river offers dam options. One particular option has been considered in the past in the lower reaches (about 10-20 km from the mouth) which is not within the Marlborough district. The Clarence catchment has high recreational and scenic values, and application for any large scale water related consent such as Hydro Electric Power generation would require thorough assessment.

Other issues

On the Clarence and Acheron Rivers there could be cross boundary issues relating to water allocation which need a co-operative approach between MDC and ECan, and this needs to be considered at the time of RPS and RMP reviews.

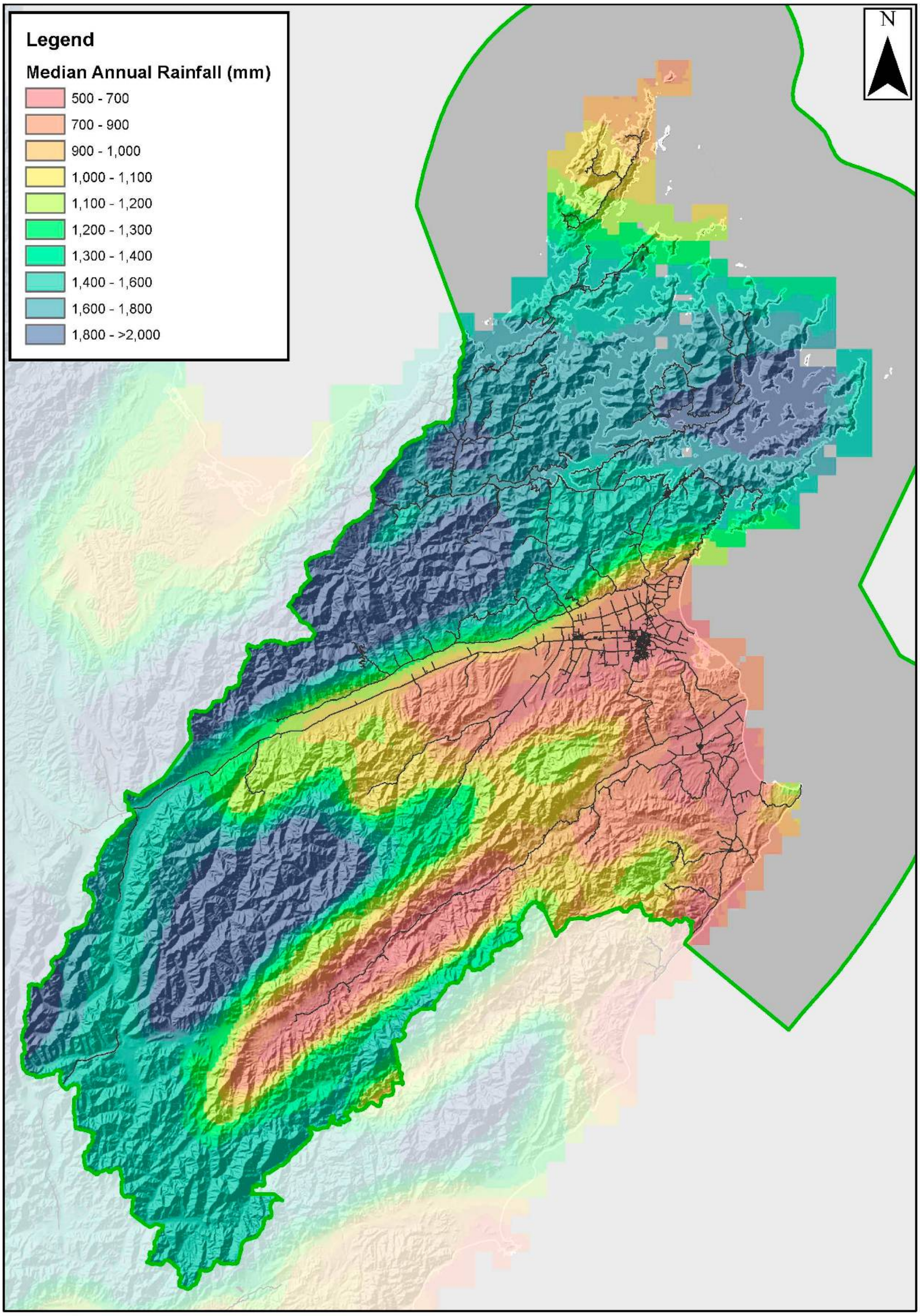
Summary of current status

- The Clarence and Acheron Rivers, and their tributaries do not have any SFRs set, so have no direct environmental protection under the WARMP.
- There are no allocation limits from these water resources, so all applications need to be considered on a case by case basis.

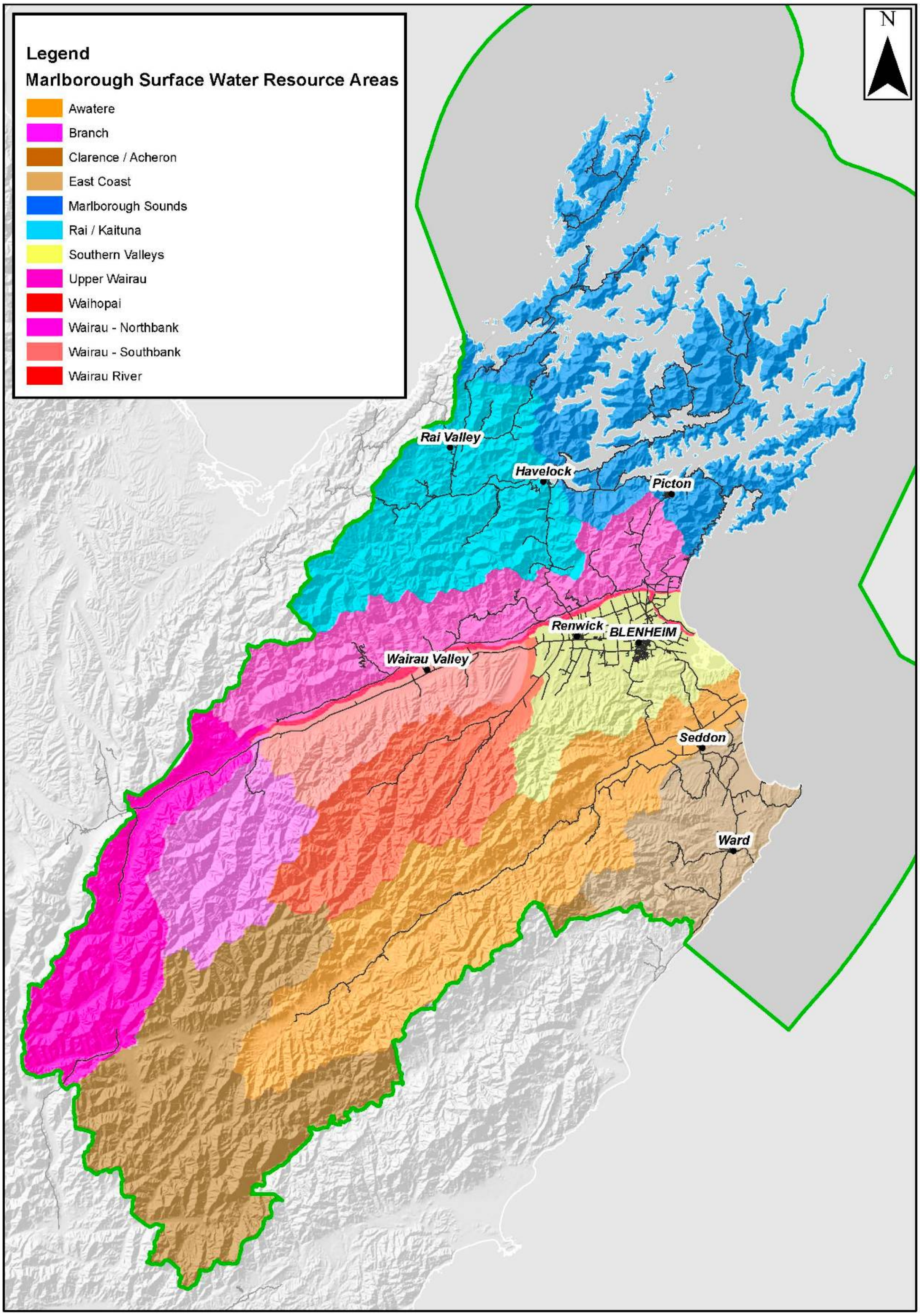
7. Definitions and Abbreviations

5Y7DLF	5 year 7 day low flow
10Y7DLF	10 year 7 day low flow
AEE	Assessment of Environmental Effects
AWUG	Awatere Water Users Group
BRIL	Blind River Irrigation Ltd
CA	Catchment area (usually expressed in km^2)
ECan	Environment Canterbury
EF	Environmental Flow, or Ecological Flow
Ephemeral	A water body which only flows for short periods of time following rainfall
HEP	Hydro Electric Power
Intermittent	Rivers or streams which normally cease flowing for weeks or months each year
km^2	Square kilometres
m^3/s	Cubic metres per second, or cumecs (measure of water flow)
MALF7	Mean Annual 7 day low flow
MSRMP	Marlborough Sounds Resource Management Plan
NES	National Environmental Standard
NIWA	National Institute of Water and Atmospheric Research
Over allocation	Where the amount of water allocated is more than the allocation limits set under Council's Resource Management Plans
Perennial	A stream or river that has continuous flow in all parts of its bed all year round during years of normal rainfall.
RMP	Resource Management Plan
RPS	Regional Policy Statement
SFR	Sustainable Flow Regime
Spasmo	A model for assessing crop water requirements
TPL	TrustPower Limited
WARMP	Wairau Awatere Resource Management Plan
WVWES	Wairau Valley Water Enhancement Scheme

Appendix 1


Legend
Median Annual Rainfall (mm)
500 - 700
700 - 900
900 - 1,000
1,000 - 1,100
1,100 - 1,200
1,200 - 1,300
1,300 - 1,400
1,400 - 1,600
1,600 - 1,800
1,800 - >2,000
N

Appendix 2


Legend
Marlborough Surface Water Resource Areas
Awatere
Branch
Clarence / Acheron
East Coast
Marlborough Sounds
Rai / Kaituna
Southern Valleys
Upper Wairau
Waihopai
Wairau - Northbank
Wairau - Southbank
Wairau River
N
Rai Valley
Havelock
Picton
Renwick
BLENHEIM
Wairau Valley
Seddon
Ward