OPUS

June 2014

Ashburton District Council
Ashburton District Water Investigation

Stockwater Supply - Detailed Investigations

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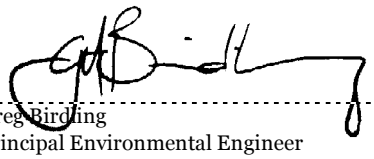
Prepared By



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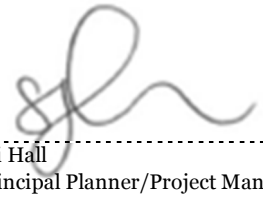

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Contents

1 Summary

This report considers options, costs and implications for potentially closing the stockwater race schemes in Ashburton District in favour of other alternative supply means. This follows a survey of the stockwater users throughout the District.

A number of options have been considered to provide stockwater service through alternative means. It appears that the most economic means will be a combination of:

- Supply via irrigation schemes for those properties without alternative supply that are located within the command area of existing and proposed piped irrigation schemes. There are a number of issues regarding this that would need to be worked through.

- Supply to some clusters of properties by restricted rural water supply schemes. These would likely use groundwater as a source of supply.

- Supply to remaining users by individual bores. We believe this will generally be less expensive per property than constructing larger schemes in most cases. Some properties may not be able to source an adequate supply due to poor groundwater resource in their area; the extent of this would not be known until wells are constructed.

Our initial cost estimate for the above is in the order of $29.1 M for the entire District. We note that this could be staged, particularly to enable races at the ends of the scheme to be closed first as they would provide the greatest reduction in water use from the intakes.

Ecological investigations to date have not identified any particular races that contain Canterbury mudfish. However, there are some areas that could provide suitable habitat and further investigation in these areas should be made before finalising race closures. The vast majority of the District does not have races that would be suitable for mudfish.

The main risks to progressing this project at this stage are:

- Whether users would be satisfied with the water quality that would be supplied from irrigation scheme networks and resulting maintenance requirements on small pipes and valves.

- If irrigation companies are willing to become stockwater suppliers. Most appear favourable in principle at this stage but would need more details before committing.

- Availability of water, particularly groundwater, to provide supply for individual properties.

- Costs, as the initial estimates will need to be refined with further investigation and consultation.

- Regulatory issues relating to the required reduction in Ashburton River abstraction and changing the use of water.

- Risk that some properties reliant on the existing network have not been identified (return rate for the survey was 75%).

2 Introduction

The purpose of this report is to present the results of an investigation into provision of stockwater services within Ashburton District. Presently, stockwater is supplied to a large area (around 233,000 ha) of the District using an open race system sourcing water from 26 intakes. This system is an inefficient way to convey the relatively small quantities of water required for stock supply. Previous work has considered what alternative uses and value the water presently allocated to stockwater could have if used for other purposes (e.g. irrigation), as well as the implications of a Policy in the Land and Water Regional Plan (LWRP) to reduce the amount abstracted from the Ashburton River catchment.

If the stockwater were to be used for other purposes, or the amount reduced to meet the LWRP policy, there would need to be an equivalent service provided by some other means. This report considers what options and costs are available for Council to consider.

In particular, the following aspects are considered:

- Identification of sections of the stockwater races that should be retained in their present open-race form for ecological reasons.
- The level of integration that may be possible between existing or proposed irrigation schemes and the stockwater supply area.
- Alternative sources of water for stockwater supply and means to distribute this to consumers that have no alternative to the present open-race system, especially at the tail-end of the existing schemes, where the greatest gain/savings can be made.
- The technical, statutory and cost implications of the above options.

Note that this report is concerned with the provision of stockwater services only, and not potable water although it is likely that there is existing unofficial and non-recommended use of stockwater for potable water within the network.

3 Areas to be Retained for Ecological Reasons

3.1 Background

There have been concerns that some of the stockwater races provide habitat for species such as the Canterbury mudfish which are considered critically endangered, and that closure of these races may be detrimental to their numbers. It is possible that any sections of race that are considered to be particularly good habitat could be retained in some way to maintain this.

3.2 Ecological Survey

Opus conducted an ecological assessment of the stockwater network during 2013 in order to meet consent requirements (*Ecological Assessment & Management Plan – Ashburton Water Race Network*). This included field investigations, stakeholder consultation and review of previous studies. The entire district comprises around 2,500 km of races, so field investigations were targeted at areas that appeared the most likely to contain mudfish; however, none were encountered. An assessment of habitat variables indicated that four locations were suitable for mudfish.

The ecological study recommended that any proposed race closures were assessed prior to closure. For the majority of races, this would be a simple desktop exercise as the race conditions in most of the network would not support mudfish. Areas that are considered to have higher values would be subjected to more detailed field assessment prior to race closure. This would allow options to be considered such as relocating any mudfish found or retaining races in some form.

If mudfish are found at any sites destined for closure, translocations will be the best mitigation option. There are wetlands, and other sites, in the Ashburton District where mudfish are known to be present that would be suitable to receive translocated mudfish. This ensures no net loss of biodiversity and provides opportunities to protect significant mudfish populations. Translocation is in line with Recommended Action 2.2.14 of the Ashburton ZIP which manages stockwater races for multiple values. A map showing the likely distribution of mudfish within the District is shown below in Figure 3-1 (adapted from O'Brien and NZFFD).

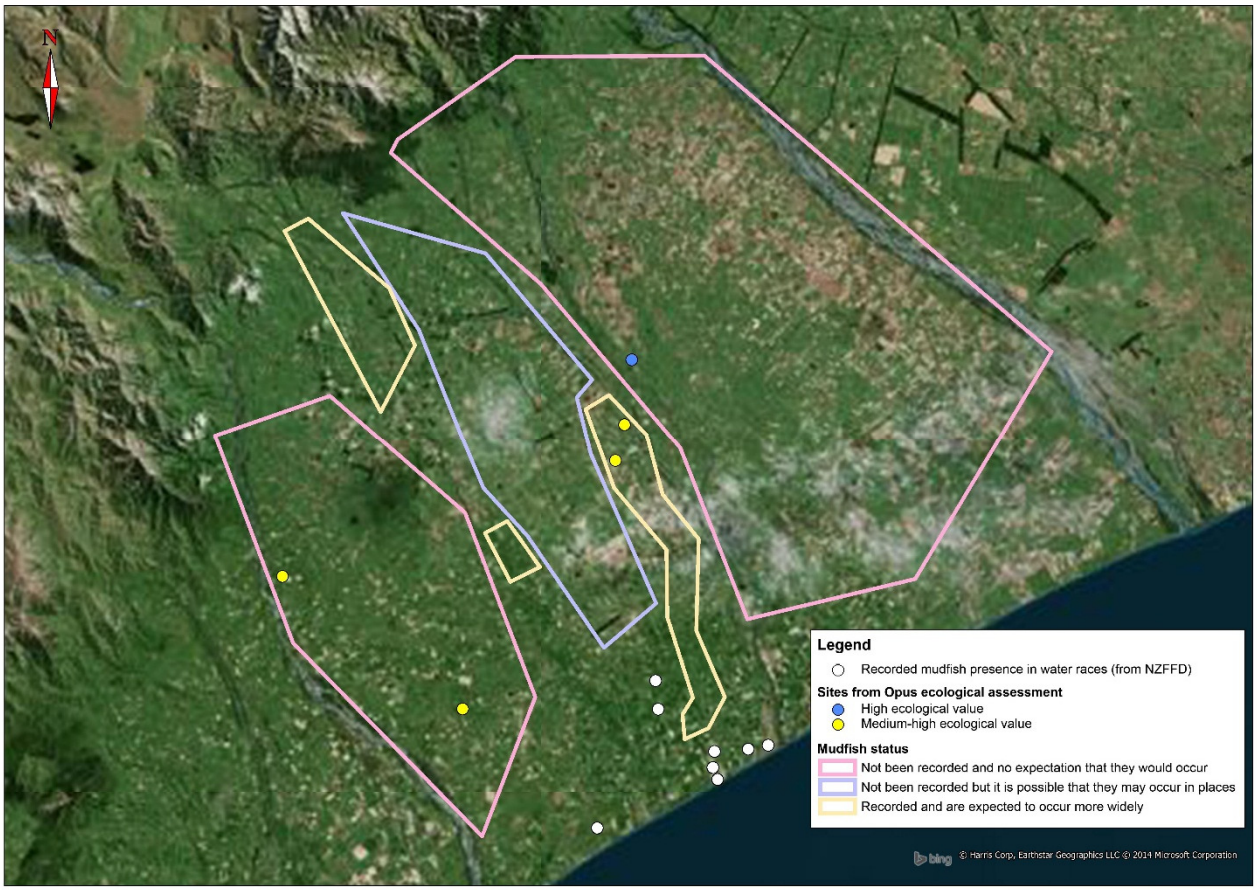


Figure 3-1: Mudfish Distribution

4 Location of Users

A survey of stockwater users was undertaken in 2012/2013 and the results presented in a report (*Opus, 2013: Stockwater User Survey*). The location of respondents with no alternative stockwater supply within the existing open-race stockwater supply areas are shown in Figure 4-1 below.

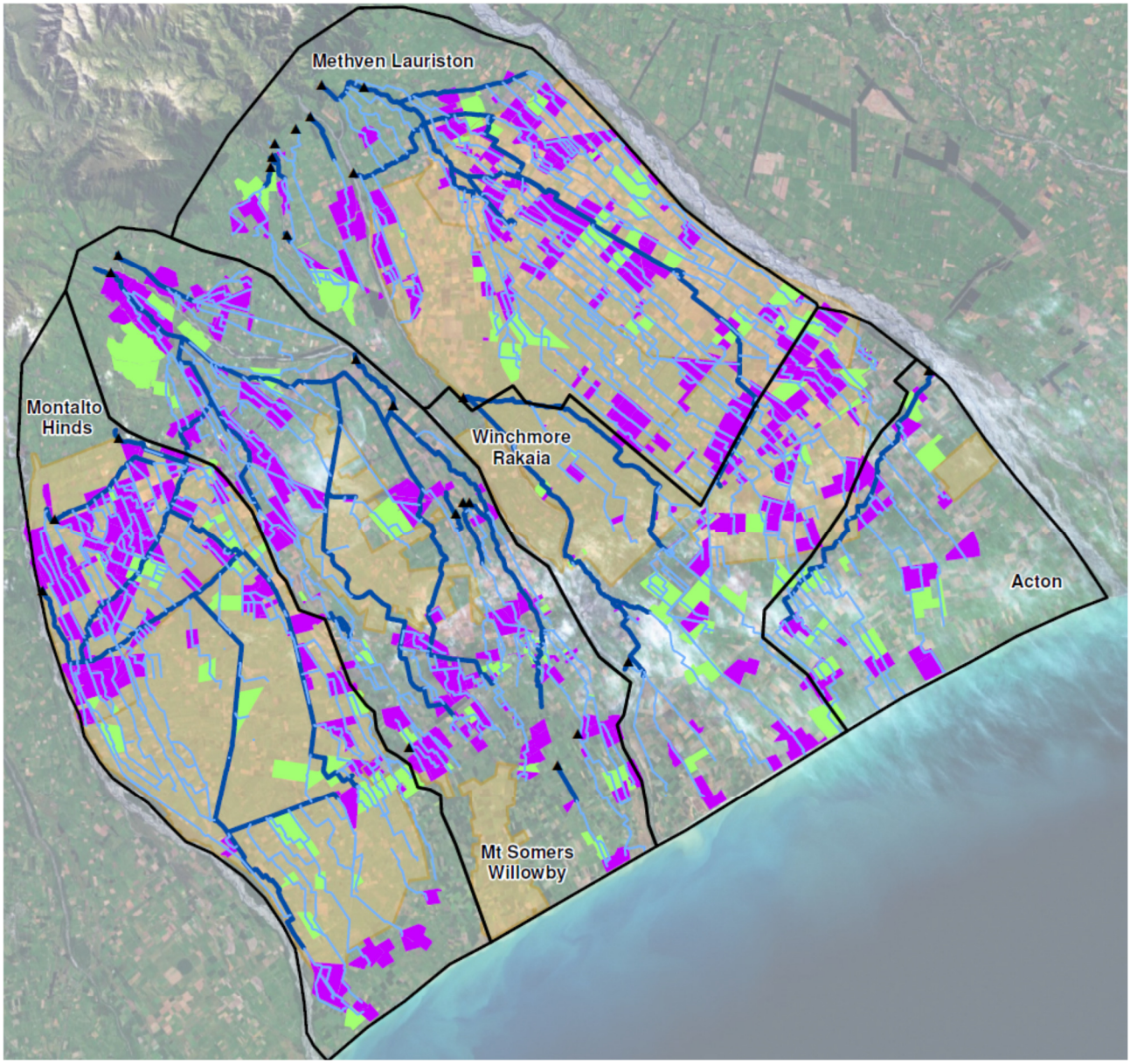


Figure 4-1: Location of Properties Without Alternative Stockwater Supply

The magenta-coloured properties do not have a reliable alternative stockwater source. The light green-coloured properties do have a reliable alternative source. The survey response rate was 75%, so there may be additional properties without an alternative supply who have not been identified in the work to date. Approximately 1,200 km of races have been closed over the last 8 years as demand for the open-race stockwater supply has declined.

5 Integration with Irrigation Schemes

5.1 General

Much of the District is serviced by a number of irrigation schemes. Most were borderdyked flood irrigation schemes using open races to convey flows, but recent enhancement or development projects have either extended the areas and/or replaced the races with piped networks. These improvements and extensions have been driven by the improvement to both network efficiency (i.e. losses through pipes are lower than in a race) and irrigation efficiency (the piped network allows water to be delivered under pressure to drive spray irrigators which are more efficient than borderdykes). Both of these improvements allow an increase in the irrigated area and/or application depth.

It has been proposed that stockwater supply may be provided in some areas by the same pipes and infrastructure installed for irrigation schemes. In this way, stockwater races in certain areas may be able to be closed. The peak flow rates required for stockwater supply are several orders of magnitude lower than what would be conveyed by an irrigation scheme, so the impact on the capacity of the irrigation scheme would be negligible.

5.2 Levels of Service

The level of service is a critical aspect of combining with irrigation networks. Many past users of the stockwater network have moved to alternative supplies at least partly due to the varying water quality supplied (particularly in some parts of the District). With an increase in dairying, many farmers recognised that good stockwater quality was necessary for top production and, as they were needing to put in better water systems for washdown etc. in any case, took the opportunity to install their own stockwater supplies.

The water supplied by major irrigation schemes will also be of varying quality. Depending on weather, the source water may be dirty for extended periods of some months, or even most of the irrigation season in extreme years. In this aspect, the water quality supplied from irrigation schemes would be no improvement on the worst current situations, and would be poorer in some areas (e.g. where the stock races are presently spring-fed).

Most of the piped irrigation schemes are undertaking to provide a minimum of 40m pressure at the farmer's connection. This is sufficient to reticulate water over most farms for stock use using small diameter pipes (e.g. 15-32mm internal diameter).

There would need to be some provision made for supplying stockwater over the winter months, when the irrigation schemes are generally not in use, and when the source is unavailable (e.g. the RDR may be shut down for maintenance for several weeks at a time). It may be necessary to use one of the existing stockwater intakes to supply the piped network during these times. In this case, some of the existing consents to take water would need to be transferred to those responsible for maintaining the stockwater supply (e.g. the irrigation companies).

5.3 Piped Irrigation Schemes

There are a number of existing and pending piped irrigation schemes. These are summarised in the table below, along with an estimated stockwater demand based on dairying over the entire area (we have used 230 L/ha/day, equivalent to an average stocking rate of about 3.2 cows/ha).

Table 5-1: Piped Irrigation Schemes

Item	Description	Area (ha)	Flowrate (L/s)	Stockwater requirement (L/s)	Comments
1	Ashburton Lyndhurst Stage 1	4,000	2,100	11	Constructed in 2008
2	Ashburton Lyndhurst Stage 2	21,000	11,000	56	Currently being constructed. Area may increase due to efficiency improvements.
3	Valetta	11,000	4,400	29	Recently completed
4	Barrhill-Chertsey Stage 1	12,000	4,500	32	Constructed in 2010-2011
TOTALS		**48,000**	**22,000**	**128**	

This shows that the amount of water required to supply stock on a peak day in the existing and proposed piped irrigation scheme areas is much less than the amount of water required for irrigation (approximately 0.6%).

Note that shareholders in the largest irrigation scheme in the district, Mayfield-Hinds Irrigation Scheme (MHIS), recently voted against piping its 33,000 ha command area. It remains possible that this scheme will become a piped scheme in the medium term.

5.4 Risks

A piped stockwater distribution network consists of smaller pipes and fittings than typically used for irrigation (e.g. 15-40 mm diameter vs. 150mm + diameter pipes and valves). Poor water quality in an irrigation network will likely cause ongoing maintenance problems in the stockwater network. The smaller diameters and flowrates mean that the water velocity in the pipe is low compared to irrigation pipes, and the pipes may build up an internal coating which reduces their capacity. Ballcocks and similar devices could give ongoing problems and need regular maintenance. If flowmeters are installed for billing purpose they would need to be electromagnetic rather than mechanical meters.

Operational experience with spray irrigators (pivots and rotorainers) that draw water from the existing race system in the MHIS area is that these can be affected by silting at the ends of the booms.

The maximum network pressure may be high in some cases. For example, the proposed Mayfield-Hinds scheme may have pressures up to 180m when irrigation demand is low. Stockwater connections will need either their own (small) pressure reducing valves or connect downstream of the one provided for the irrigation connection. Either option could be problematic – small valves are more susceptible to problems caused by poor water quality, and large valves delivering small amounts of water may wear excessively.

The difference in flow required for the scheme in the irrigation off-season may also require that separate pumps and scheme pressure reducing valves are installed (if the schemes have network pumping stations and pressure reducing valves).

5.5 Operational & Management

The requirements for operating a stockwater distribution system are markedly different to those for an irrigation network. Some of these contrasts are noted below:

Stockwater Scheme	vs.	Irrigation Scheme
Scheme must operate 365 days per year		Scheme only operates for irrigation season ~150 days per year
Loss of service can have rapid consequences for animal welfare		Loss of service has economic impact but longer outages could be tolerated
Scheme maintenance affects consumers		Major maintenance on scheme can be completed during off-season without affecting consumers.

The lines of responsibility for a stockwater scheme supplied off an irrigation scheme would need to be clearly defined. Some form of service level agreement would be required between the irrigation company and Council, or Council would need to entirely divest its responsibility for providing stockwater to the irrigation company. The legal mechanism for this would need to be confirmed as the Local Government Act 2002 may restrict this, or require a formal consultative process to be followed.

5.6 Summary

There is a natural alignment of the irrigation and stockwater supply schemes in respect of the area serviced and the skills required to operate and maintain them. We believe it will be technically feasible to provide stockwater service using irrigation scheme infrastructure, subject to two key criteria:

- The water quality is considered adequate by potential consumers for stock use (noting that it will be similar to or possibly worse than the existing supply).
- The risks associated with maintenance on the smaller pipes and fittings for stockwater supply are considered acceptable.

There would also need to be buy-in at irrigation scheme management level to provide the service levels required for stockwater which would be more onerous than those for irrigation. Being responsible for stockwater services as well as irrigation would require additional resourcing and management systems. Initial discussions with the major irrigation schemes (MHIS, ALIS, Valetta and BCI) indicate that they are generally favourable, in principle, to the prospect of adding stockwater supply to their networks.

If irrigation networks were not used to directly supply stockwater, there could still be some opportunities to install separate piped stockwater networks and share costs with proposed irrigation schemes in places – such as co-trenching and for road crossings. The additional cost required to install a second, smaller pipe in the irrigation pipe trench for stockwater use would be fairly low and the road crossings in particular would be particularly attractive. However, there would need to be consideration given to the pipe alignments as the irrigation pipes may often be laid on private land which would make the long term management of the stockwater network more difficult (especially if a restricted scheme was installed as these are vulnerable to tampering).

6 Alternative Stockwater Supply

6.1 General

The most cost and water efficient way to deliver stockwater to rural areas is usually to install a restricted piped water scheme. This requires that all consumers have storage tanks and are supplied via a flow restrictor which limits the maximum flowrate into the tank. This minimises the size of pipes required to service an area and hence the capital cost of the network. Consumers are usually rated by the size of the restrictor installed, so there is an incentive to use the water efficiently.

In restricted schemes consumers may need to provide additional pumping if their tank is not high enough above their troughs to provide gravity supply, or if they need to reticulate water a long way within their properties.

A proviso of a restricted supply network is that the water quality must be good or there will be ongoing maintenance issues with the flow restrictors, ballcocks and relatively small pipes used (typically pipes from the mains will be in the order of 25mm internal diameter or smaller). If the water is silty then this is likely to cause ongoing maintenance issues. Good quality water will be more palatable to stock as well as minimising maintenance requirements.

We note that it is likely that the provision of better and more consistent quality water for stock may result in (more) consumers also using it for potable water. This should be strongly discouraged as any 'official' endorsement of the supply for potable use would trigger a legal requirement to comply with drinking-water legislation. The stockwater user survey identified that about 7% of properties used the stockwater for potable water supply at least some of the time.

6.2 Surface Water

Given the need for good quality water for a restricted network, most of the surface water sources in the District would not be suitable as they are often dirty for periods following rainfall. The most attractive sources would be springs which run clear year round. Within the District there are a number of existing spring-fed sources that are already utilised for stockwater supply via open races, including:

- Winchmore (consented for 790 L/s)
- Clearwell Springs (100 L/s)
- Langdons Springs (40 L/s)
- Langdon's Creek (120 L/s)
- Lagmhor Creek (56 L/s)
- Remington Creek (120 L/s)
- Shepherds Brook (80 L/s)
- Maginness Drain (30 L/s)

- Flemington Drain (100 L/s)

There are also likely to be other springs of varying capacity in the District that are presently not used for stockwater. These may also be suitable for use, although the lack of an existing consent is a disadvantage.

Some of the existing intakes are some distance from their spring sources; the channel that takes the flow will also intercept surface water during rain events which will reduce the water quality at times. If the water is to supply a piped scheme, the ideal situation would be to tap springs as close to their source as possible in order to reduce the amount of runoff that could contaminate the water.

6.3 Groundwater Resource

There is a significant groundwater resource available through much of the District. However, there are several areas that have not (to date) produced many satisfactory wells. Generally, from about SH1 to the coast there have been many good quality and high-yielding wells constructed and used, and groundwater sources tend to be shallower. Between SH1 and the foothills there have been fewer successful wells and the yield has usually been lower, with deep wells required.

ADC's potable water supplies demonstrate this trend with schemes such as Ashburton, Chertsey, Rakaia, Hinds, Winchmore, Dromore, Lake Hood and Hakatere all using groundwater sources. Other schemes such as Methven, Methven/Springfield, Mt Somers and Montalto use either surface water (via weir intakes) or shallow groundwater (via infiltration galleries). Mayfield was also supplied with surface water (via a stockwater race) but has recently changed to a bore supply; however this is of limited capacity and is only marginally adequate to provide reliable water supply.

The lower quality requirements of stockwater vs. potable water should improve the chances of finding an adequate groundwater supply compared to potable water. We note that some groundwaters in the District have been found to have high iron and/or manganese levels which could become a problem from staining/sliming and reduced palatability to stock.

6.4 Regulatory Considerations

6.4.1 Surface Water

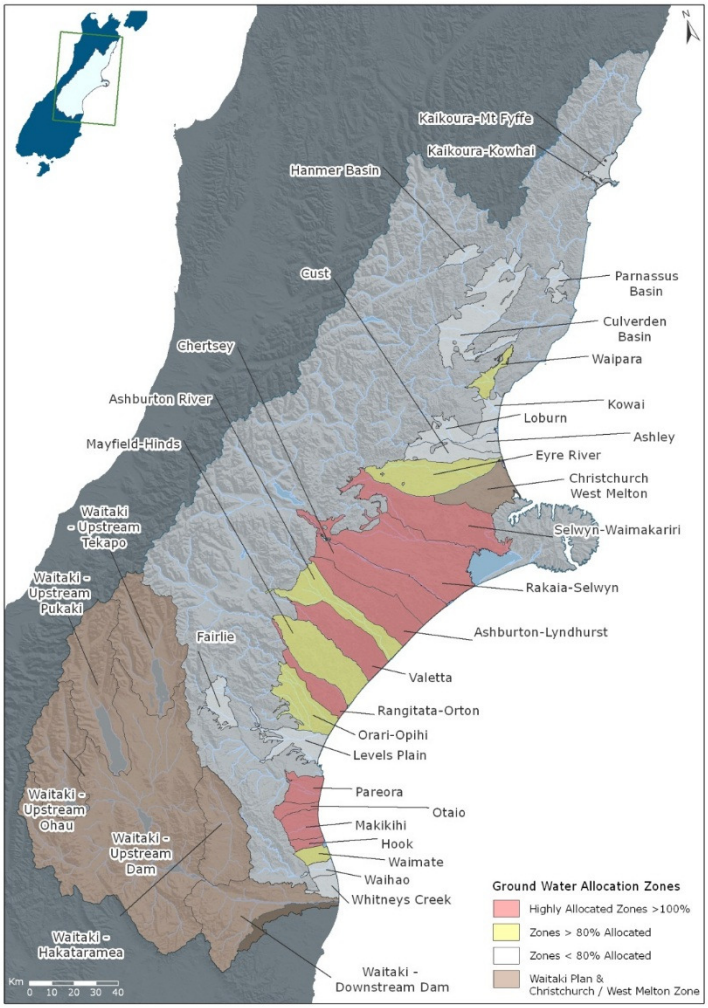
Council have the authorisation to use their spring fed intakes under the existing resource consents. The amount of water required to supply piped schemes would typically be lower than the amount presently allowed under the consent.

It is likely that the conditions of the consents would need to be varied to reflect the change in the nature of the takes. These might include:

- The type of take would change from an open channel to a pipe so the metering requirements would change (i.e. meters would be required in place of the existing flumes)
- Reducing the rate and volume of the take.

6.4.2 Groundwater

The groundwater resource in most of the District is typically red-zoned, meaning that it is technically over-allocated and no further use is allowed. However, accessing groundwater for community stockwater supply is possible through an offsetting policy which allows groundwater to be used when surface water is surrendered. Some areas in the District are 'yellow zoned' which means it is 80-100% allocated. Some of these areas are located where there appear to be poor conditions for wells which would explain the lower uptake for the resource.



For individual properties, the current planning rules under the NRRP are that consent is required to construct the well, but no consent is required to take water for stock use provided less than 5 L/s and 10 cubic metres per day is taken (this would not be enough for many properties, and a consent would be required).

The proposed Land and Water Regional Plan requirements are such that no consent would be required for most bores supplying stockwater, where up to 100 cubic meters per day is taken at a rate up to 5 L/s, subject to meeting certain conditions.

6.4.3 Policy Considerations

Policy 13.4.1 of the proposed Land and Water Regional Plan seeks a reduction in stockwater from the Ashburton River to 2.9 cumecs by 2023. This policy may be given effect to via an Environment Canterbury review of Council's consents. However, such a review would not be able to make the existing consents granted in 2012 impracticable for the existing operation.

7 Concept Design

7.1 General Assumptions

We have prepared an initial concept design to supply existing stockwater users without alternative supply based on the following assumptions:

- Any piped scheme supplying stockwater to multiple properties will be a restricted scheme and consumers would be required to provide tanks (2 days' storage) and some may need pumping. The point of supply would be at the property boundary (i.e. within the road reserve) to provide convenient maintenance access to the restrictor/toby box and to discourage tampering.
- Areas within the Barrhill-Chertsey, Valetta and Ashburton-Lyndhurst piped irrigation schemes will be serviced using the irrigation networks based on generally favourable early consultation with these irrigation companies.
- Areas between SH1 and the coast would be supplied with groundwater from new wells. These are expected to be fairly shallow (i.e. <50m deep).
- Areas at the top of the scheme (e.g. Mt Somers area) would be supplied by new groundwater sources. This may require deeper wells, but we have assumed that sufficient water could be found for stockwater supply.
- The design capacity will be based on 230 L/ha/day which is sufficient for most dairying applications. Note that any properties with significant beef, lamb or cropping activities would have lower requirements.

At this stage the design concept is preliminary only, for the purpose of making an initial assessment of what the costs are likely to be.

7.2 Properties in Piped Irrigation Schemes

These properties would be supplied from the same lateral that will provide irrigation service. The connection would be made upstream of the pressure reducing or control valve that supplies the on-farm irrigation, and the flow to the stockwater system would be separately metered (assuming this would be a requirement of the irrigation company). If the maximum pressure were to exceed say 80 m head, a separate pressure reducing valve would be required to protect the on-farm reticulation.

On farm pipes should be generously sized to provide some margin for capacity loss due to silting. It may also be worthwhile to install some flushing points to enable convenient flushing and/or swabbing.

A summary of properties without alternative stockwater supply that are within the supply areas of piped and potentially piped irrigation schemes is below:

Table 7-1: Stockwater Users without Alternative Supply in Piped Irrigation Schemes					
Item	**Description**	**Number of Properties**	**Area** (ha)	**Stockwater requirement** (L/s)	**Average Property Size** (ha)
1	Valetta	11	1,050	2.8	95
2	Ashburton – Lyndhurst	55	3,900	10.4	71
3	Barrhill-Chertsey	98	7,230	19.2	74
TOTALS:		**164**	**12,180**	**32.4**	**74**

There are about 54 properties in the MHIS area without alternative supply.

7.3 Clustered Properties

There are groups of properties without alternative stockwater supply that are outside piped irrigation scheme areas. These groups could be serviced by restricted rural water supply schemes which would service the properties. Such schemes would include:

- A water supply headworks, preferably at the higher part of the scheme to minimise pumping costs. This could utilise a groundwater source (if available) or a good quality surface water source (e.g. springs). Sources that are turbid for extended periods would not be very suitable (e.g. RDR, main rivers).
- Trunk reticulation in road reserves to distribute water to consumers.
- Connections to each property made at the boundary including a flow restrictor.
- On-farm infrastructure including a storage tank, reticulation and troughs.
- Monitoring and control facilities as needed for efficient scheme operation. We expect that Council would remain responsible for the operation and maintenance of any schemes.

We have looked at the properties and possible clustering of them into small schemes. Because of the long distances between properties, it becomes quite expensive to install reticulation networks. From our initial assessment of costs, it appears that there are only a fairly small number of areas where such schemes would be less expensive per property than installing individual supplies (assuming that individual supplies have feasible sources available).

The location of these clusters is shown in Figure 7-1.

A summary of these clustered schemes is given below in Table 7-3.

Table 7-2: Stockwater Users Without Alternative Supply in Clusters					
ID	**Description**	**Number of Properties**	**Area** (ha)	**Stockwater requirement** (L/s)	**Average Property Size** (ha)
1	Rakaia	33	2,850	7.6	86
2	Hinds	28	2,240	6.0	80
3	Ruapuna	33	4,771	12.7	145
4	Methven	9	120	0.3	13.3
5	Cavendish	9	920	2.4	102

The Methven cluster is located adjacent to the Methven township, and the average property size is small which suggests that these are predominantly lifestyle properties. Given the small demand, it may be sensible to supply these from the township supply.

The Ruapuna and Cavendish clusters are located in areas that have fairly poor groundwater resources. Suitable groundwater may not be available, or may be expensive to access. The existing stockwater intakes in the vicinity of these sites may need to be retained (e.g. Limestone Creek and Brothers), albeit at a reduced rate of abstraction.

7.4 Other Properties

There are a number of other properties which do not have alternative supply available and which are not near enough to provide for economic clustering. For these properties the most economic solution is to provide individual stockwater supplies. In many cases, we expect that these could be provided by constructing wells on each property.

In some cases there may be difficulty in obtaining alternative supplies, and this may not be known until attempts are made to construct wells on these properties. Some areas are already known to have fairly poor groundwater resource (e.g. in the vicinity of Mayfield), and it may prove that supply schemes would be required in any case which either provide groundwater from further away or use a surface water source.

Since these individual supplies would be on private property and for the benefit of that property owner, we expect that the cost for these would be a one-off and the responsibility for operating and maintaining the supply would pass to the property owner. Council should consider what, if any, share of this cost they are prepared to bear.

Table 7-3: Individual Stockwater Users					
ID	**Description**	**Number of Properties**	**Area** (ha)	**Stockwater requirement** (L/s)	**Average Property Size** (ha)
	Individual Properties	245	19,047	50.7	78

It would be possible to stage the installation of individual property supplies so that properties on the end of the network are transitioned first. This would give the most benefit to reducing the water required for the open channel scheme as these properties are the most distant from the intakes, and more water is lost during conveyance. These properties are also on the coast side of SH1 where groundwater resources are more likely than towards the foothills.

7.5 Summary Map

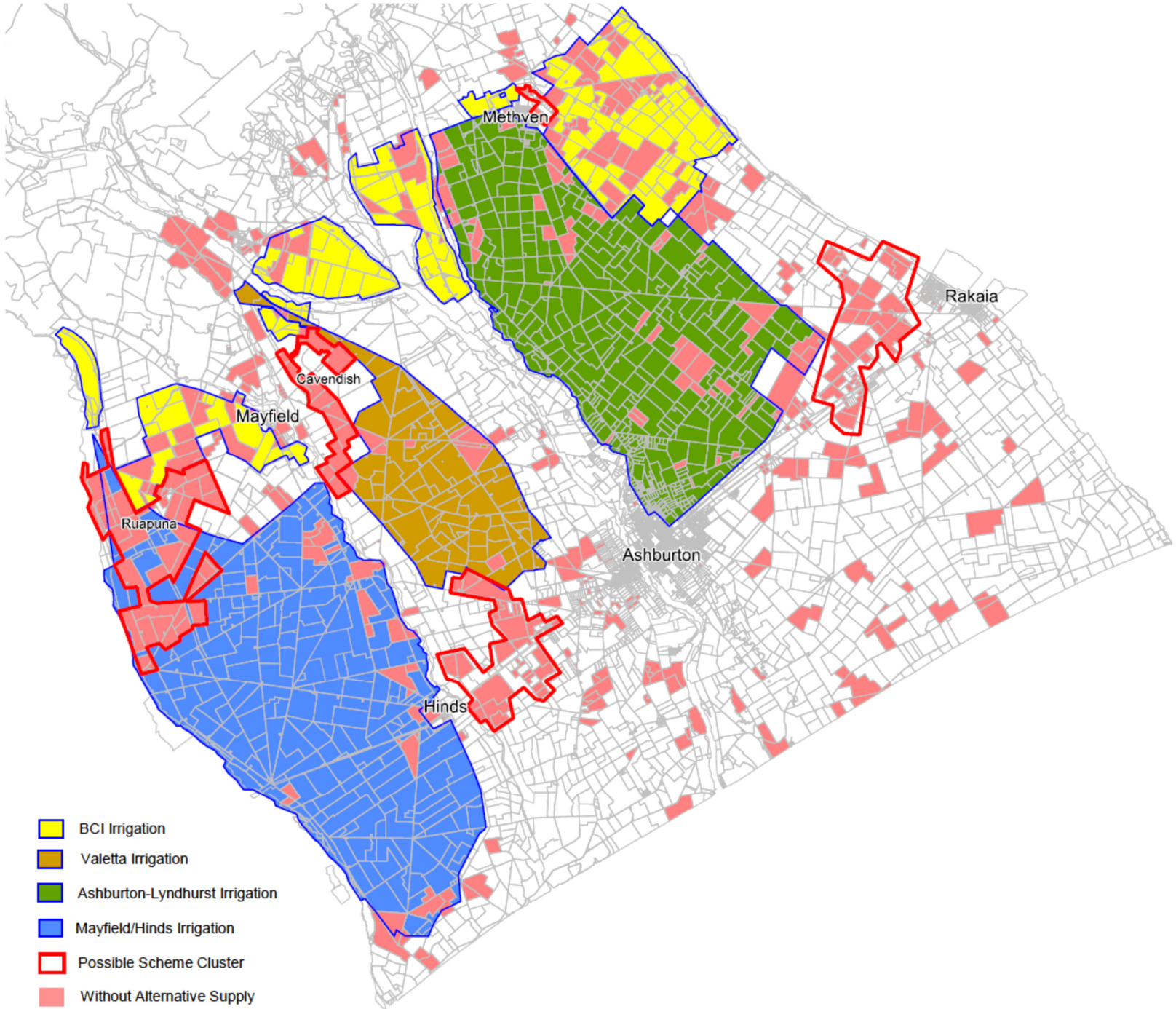


Figure 7-1: Summary Map

7.6 Costs

We have made a preliminary estimate of the costs of providing stockwater to properties without alternative supply. These costs are based on the following assumptions:

- A 15% contingency has been added to all cost estimates.
- An allowance of $0.5M has been made in each of the four irrigation schemes to provide some back-up supply for when the RDR is out of service.
- On-farm costs are estimated based on 25 troughs per property at a rate of $400 /trough (including base preparation, 750 L trough, float valve, and installation) and a pipe length of 2 km at a rate of $5/m (assuming mole-ploughed DN32 PE pipe). This equates to $20,000 per property.
- There would also be a cost of approximately $3,000 per property for a water meter and isolating valve on irrigation schemes, and $4,000 for a restrictor and storage tank on clustered piped schemes.
- Costs for pipe supply networks are estimated at $150/ha (net) of the supplied area. Note that the costs for gross area were estimated at $255/ha at the hearing for stockwater consent.
- Costs for individual groundwater supplies are based on three bands – below the 100m contour where wells are expected to be shallow (e.g. 20m); between 100 and 300m contours where wells would typically be 50m deep; and above the 300m contour where wells may be 120m deep on average. The estimated cost of individual bore supplies (excluding on-farm costs) ranges from about $26,450 below the 100m contour to $54,050 above the 300m contour with an average cost of about $460/ha.

Table 6-2: Alternative Stockwater Supply - Estimated Costs

Item	Description	Number of Properties	Estimated Cost	Cost per Property (incl. on-farm)
1	Supplied from Irrigation Schemes	164	$ 7.3 M	$ 44,500
2	Clustered Schemes	112	$ 7.0 M	$ 62,500
3	Individual Supplies	245	$ 14.8 M	$ 60,400
TOTAL		**521**	**$ 29.1 M**	**$ 55,860**

At this stage the level of confidence in this estimate is fairly low as there are a number of project risks that could affect this cost and only concept design has been completed to date.

8 Reduction in Stockwater Take

8.1 Existing Takes

At present, Council have resource consents to take approximately 8 cumecs of water from 26 intakes, plus agreement to take an additional 230 L/s from the RDR at Klondyke. If the existing stockwater supply network were serviced by the other means discussed earlier in this report, there would be a significant or possibly even a total reduction in the amount of water required.

Table 7-1: Stockwater Takes

Water Source	**Consented Rate** (L/s)
Ashburton River North Branch (Methven Auxiliary)	1,300
Ashburton River South Branch (Brothers)	1,955
Other Ashburton River tributaries	1,310
Winchmore (Ashburton River springs)	790
Rangitata River (Cracroft)	849
Hinds River (Limestone Creek)	50
Rakaia River (Acton Irrigation Scheme)	680
RDR (Klonydke)	230
Springs	160
Drains	691
Total Consented Flow	**8,281**

In reality the maximum amount actually taken into the stockwater network is usually limited to about 50-70% of the total consented rate. This is because many intakes cannot supply their full flow during dry periods when demand is highest as the water is either not present for abstraction, or the intake structures and works are unable to capture the full consented allocation when the rivers are low. However, when the rivers are high, the flows into some intakes can be much higher and the consents allow for this.

8.2 Potential Reduction

Our earlier assessment of the volume of water actually available with 95% reliability from the present intake structures is about 4.4 cumecs (note that this includes domestic and stockwater), primarily due to many of the smaller intakes being badly affected during dry periods, or the intakes not being physically able to take more water. Some of this water may be required to provide alternative supply (e.g. to supply irrigation schemes when the RDR was out of service).

9 Conclusions

9.1 General

Based on our investigations, it seems clear that there is an opportunity for the District stockwater race network to be largely abandoned in favour of supplying stockwater by other means.

There are several factors which are in favour of such a change:

1. A general shift in farming practices and expectations in respect of stockwater supply. Many properties now no longer use or want the open-channel stockwater network, and are using alternative supplies that they have established themselves.

2. A change from open-race irrigation schemes to piped irrigation schemes over much of the District, thereby providing a possible alternative supply mechanism. There are a number of challenges with providing stockwater using a piped irrigation network, but irrigation schemes appear to be generally receptive to the idea.

3. There is pressure from regulators to reduce the amount of water taken for the current stockwater network which is not an efficient means of delivering relatively small amounts of water over a large area. This means that obtaining consents is likely to become more difficult and expensive in future, and the amount of water permitted may be reduced.

9.2 Ecological Considerations

Previous work on the ecological value of the stockwater races suggests that there are either very few or none that are ecologically valuable (particularly to Canterbury Mudfish); however in some areas conditions could favour mudfish. These areas are fairly small and generally located in the Ashburton Forks and Mt Somers areas, so do not greatly impact on the broader issue of alternative supply. In these areas a more detailed assessment should be made before committing to closing races in case there are options to retain races or relocate fish etc.

9.3 Alternative Supplies

The provision of stockwater by other means to users outside of the current and proposed piped irrigation network areas would require investment in new supplies and pipe infrastructure. The scattered location of properties that still require stockwater supply means that, in most cases, each property would be most economically serviced by its own supply. There are only two areas which have enough properties to make a supply scheme economically competitive.

Some of these properties are located close to Council's existing potable water supply infrastructure (e.g. Mt Somers, Methven) and it may be that these could be used to supply some properties. This approach may require a change to Council policies relating to connections and supply boundaries, and further investigation to confirm the impact on the existing networks.

Supplying stock needs using the piped irrigation networks appears to be feasible, although the water quality may not meet expectations of consumers (especially if they were previously on spring-fed races). There is also some risk of ongoing maintenance issues in the smaller pipes and valves used for stock reticulation, and irrigation companies would need to assume responsibility for the provision of stockwater service.

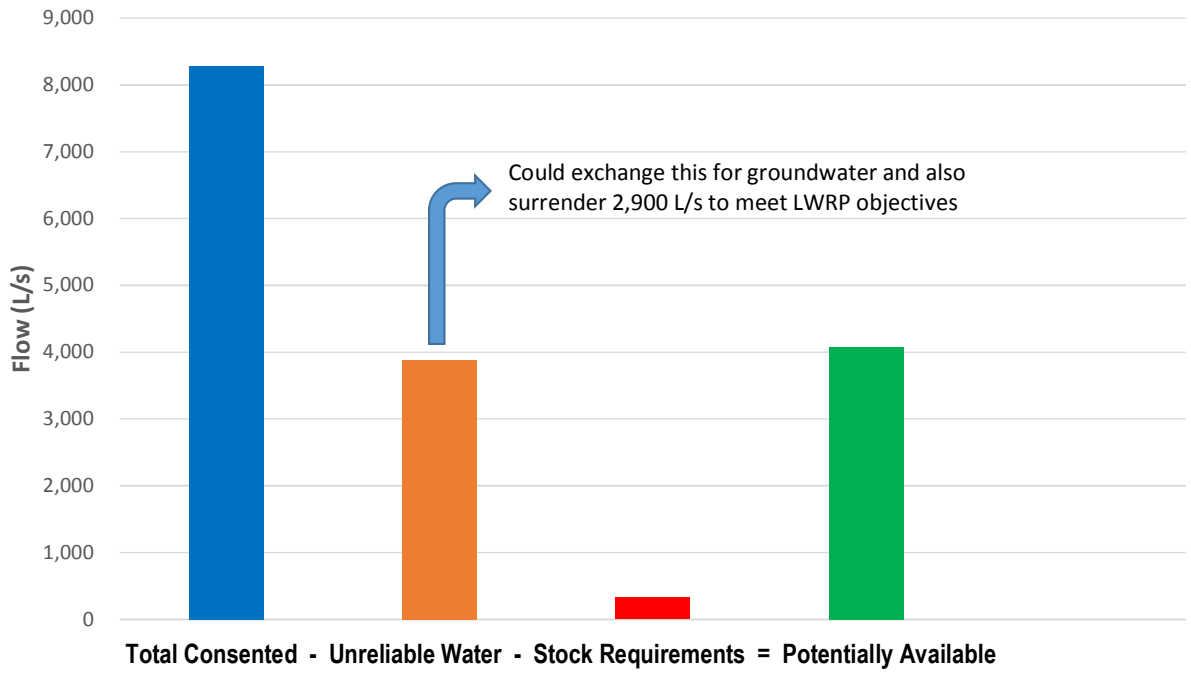
9.4 Reduction in Water Taken

A result of providing stockwater by alternative means is that the existing resource consents held by ADC totalling approximately 8 cumecs would no longer be needed for stockwater supply; or at least only a small proportion would be needed (e.g. if groundwater resources were inadequate in some areas, or to provide a backup supply). This provides a possible opportunity to reduce the amount of water taken out of drought-sensitive rivers, and/or to re-allocate the water for some other use and/or for biodiversity enhancements.

There is a Land and Water Regional Plan (LWRP) policy (13.4.1) that abstractions from the Ashburton River need to reduce to 2.9 cumecs by 2023. Previous work has considered swapping this surface water for groundwater, which could then be potentially used for irrigation. The abstraction of groundwater in exchange for the surrendering of surface water in the Ashburton catchment is supported in the LWRP.

If some of the water were to be used for irrigation, it could provide a revenue stream to ADC that would mitigate the cost of providing alternative supplies. The reliable amount of water actually available for other uses for irrigation would be no more than about 4 cumecs across the stockwater network, provided stockwater is provided by an efficient means. Some of this may be required to provide service when the irrigation sources are unavailable for stockwater supply. Fig. 9-1 shows how this figure is arrived at (note that no allowance for 'Domestic' water is made; 5% was previously allowed for this).

Fig 9-1: Stockwater Consent Breakdown



9.5 Costs

The total cost for providing stockwater for the District using alternative means has been estimated at about $29.1 M including on-farm costs. This includes on-farm costs (i.e. troughs and pipes).

These costs are preliminary only and would need to be refined following more investigation of the feasibility of each alternative supply.

9.6 Risks

There are a number of risks and challenges to such a change in the provision of stockwater services, including:

- Incomplete user information: Although the response to the stockwater user survey was very good at 75%, there may be users reliant on the existing service who have not been identified.
- Willingness of irrigation companies to provide stockwater: Although most appear favourable in principle, they would require greater detail as to what the impact on their business would be in order to confirm their acceptance. The next step in this project should be to confirm possible commercial terms with these parties.
- Effect of poor water quality on small pipes used for stockwater: This could create ongoing maintenance issues for property owners, even if carefully designed and managed. A design guide or code of practice may help to reduce this risk.
- Expectations of users: There may be an expectation that a change to irrigation water will improve water quality, but in some cases it may be worse (e.g. where spring-fed stockwater becomes RDR-fed stockwater).
- Regulatory issues: Consents for irrigation using the existing stockwater would be required. It is possible that the terms of these will reduce or eliminate any revenue stream that would offset the capital costs of this project. As it stands, the policy in the Land and Water Regional Plan requiring a reduction in Ashburton River stockwater take to 2.9 cumecs may be implemented via a review of the existing consents initiated by Environment Canterbury.
- Costs: There is no doubt that the existing stockwater service is provided at very low cost to consumers. Any installation of alternative stockwater supplies will likely result in an increase in rates to cover the costs associated with this (even if there is revenue available from freeing up stockwater takes for other uses).
- Groundwater availability: There may be some areas where groundwater is too poor in quality or the yields are too low to obtain suitable stockwater supply. This could mean that some piped schemes would need to be constructed.

10 Recommendations

We recommend that:

1. Council begin formal talks with irrigation companies to confirm the viability of supplying stockwater within their areas and discuss commercial terms.
2. The feasibility of individual water supplies is further assessed, particularly the availability of groundwater supply.
3. Preliminary design work is completed on potential piped supply schemes.
4. Council maintain contact with ECan to keep them informed of the project and progress towards meeting the LWRP objectives.

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