

Memo

Date	5 March 2018
To	Mark Megaughin, Zeb Etheridge, Alastair Picken, Maureen Whalen
From	Matt Dodson and Jen Dodson

Estimating permitted water use in the Waimakariri zone

Key points

- The Land and Water Regional Plan (LWRP) and Resource Management Act (RMA) allow people to use a limited amount of water without consent. In planning language, these are referred to as '*permitted activities*' therefore we chose to refer to these takes as '*permitted water takes*' and there use as '*permitted water use*'.
- Permitted water takes are not required to be metered.
- We therefore made the assumption that water users do not take more than their permitted water use allowances.
- We acknowledge that because these takes are not metered, some individuals could potentially be taking volumes in excess of their allowance.
- Our assessment is based on the Dodson and Lough (2013) method
- We have estimated how much water is used for peoples domestic and stockwater needs, the taking of which is authorised by the RMA Section 14(3)(b) (we refer to these as '*RMA permitted water takes/use*').
- And we have also estimated permitted water use authorised by the LWRP (we refer to these as '*LWRP permitted water takes/use*'). LWRP permitted water use is an amount of water, limited by a maximum rate of take and daily volume, that can be used for any purpose.
- We chose to estimate RMA and LWRP permitted water use separately to appropriately answer the questions we have been asked.
- We conclude that if people do abide by the rules, the cumulative size of RMA and LWRP permitted water takes are likely to be small, particularly when compared to the total amount of consentable water available.
- We also conclude because our RMA permitted water use estimates for rivers are within gauging errors, then they do not need to be considered when reviewing surface water allocation regimes.

Potential solutions for water use in excess of a permitted use

- Education programmes for permitted water users on the quantity of water they can take without a consent.
- Compliance monitoring of permitted water users who are clearly and repeatedly breaking the rules.

Planning context and permitted water use definitions

The Resource Management Act (RMA)¹ and the Land and Water Regional Plan (LWRP)² allows people to take a limited amount of water without the need for a consent. Activities that do not require consent are called '*permitted activities*'. In this document we refer to takes that do not need consent as '*permitted water takes*' and their use as '*permitted water use*'. We will also differentiate between '*RMA permitted water use/take*' and '*LWRP permitted water use/take*'. Table 1 lists the main differences between RMA and LWRP permitted water takes.

Table 1: Major characteristics of RMA and LWRP permitted water takes

Characteristics	RMA	LWRP
Water can be used for:	Domestic and stockwater only	Any use
Water use limited by:	<ol style="list-style-type: none">1. Individual's reasonable domestic needs and needs of a person's animals for drinking water (Table 2 lists what we considered reasonable needs for the purpose of this study)2. If the taking or use does, or is likely to, have an adverse effect on the environment	Maximum rate of take and daily maximum volume depend on source of water and size of the river (see Table 3 and Table 4 for details)
Ceases at a LWRP minimum flow:	No	Yes
Requirement to be metered:	No	No

Memo purpose

This memo serves to provide advice:

- to the Waimakariri Water Zone Committee about the scale of permitted water use in their zone
- on if RMA permitted water takes need to be considered during the process of setting a surface water allocation regime
- on the potential environmental impact of the existing permitted water use rules.

¹ Section 14(3)(b)

² Rules 5.111, 5.112, 5.113 and 5.114

Method

In the following sections we will briefly describe our method, for the reader wanting more detail, we refer you to Dodson and Lough (2013).

For our analysis we choose to estimate RMA and LWRP permitted water use separately. We did this because we felt this would best answer the questions we were being asked.

RMA permitted water use estimate

Permitted water takes are not required to be metered therefore, we need to use indirect methods to estimate their scale. We choose to use the 'stage one calculations' of Dodson and Lough (2013, pages 18 to 20) to estimate RMA permitted water use, for both selected groundwater allocation zones (GAZ; Figure 1) and surface water allocation zones (SWAZ; Figure 2) within the Waimakariri zone. We only included in our study rivers that have existing SWAZ boundaries and we did not include the Kowai GAZ because its straddles the Waimakariri and Hurunui-Waiau zones.

Our calculations estimate the number of people and animals by stock type, **not** serviced by a consented Territorial Authority (TA) water or stockwater scheme. Once the number of stock and people have been estimated, we then then apply the values from Table 2 as multipliers to calculate an average daily permitted water use.

We believe our estimates are a fair representation of RMA permitted water use in the Waimakariri zone.

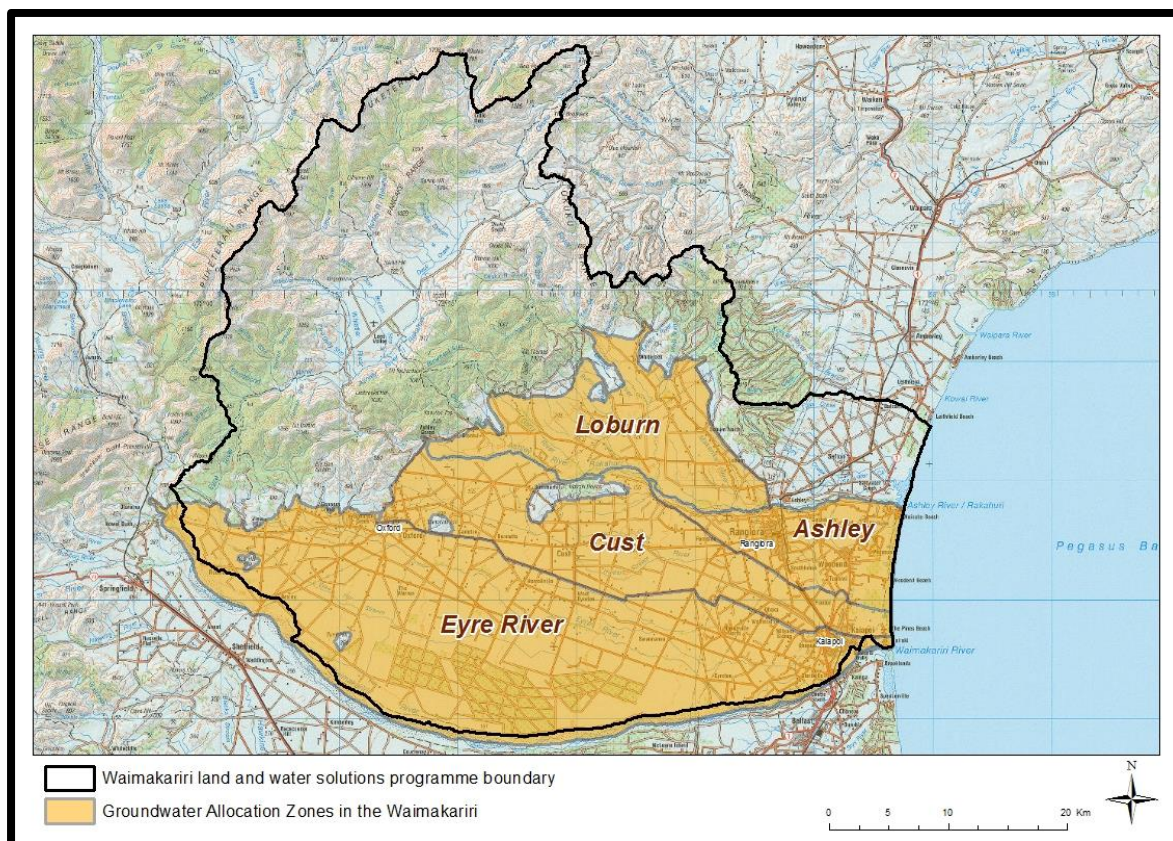


Figure 1: Selected GAZ's within the Waimakariri zone

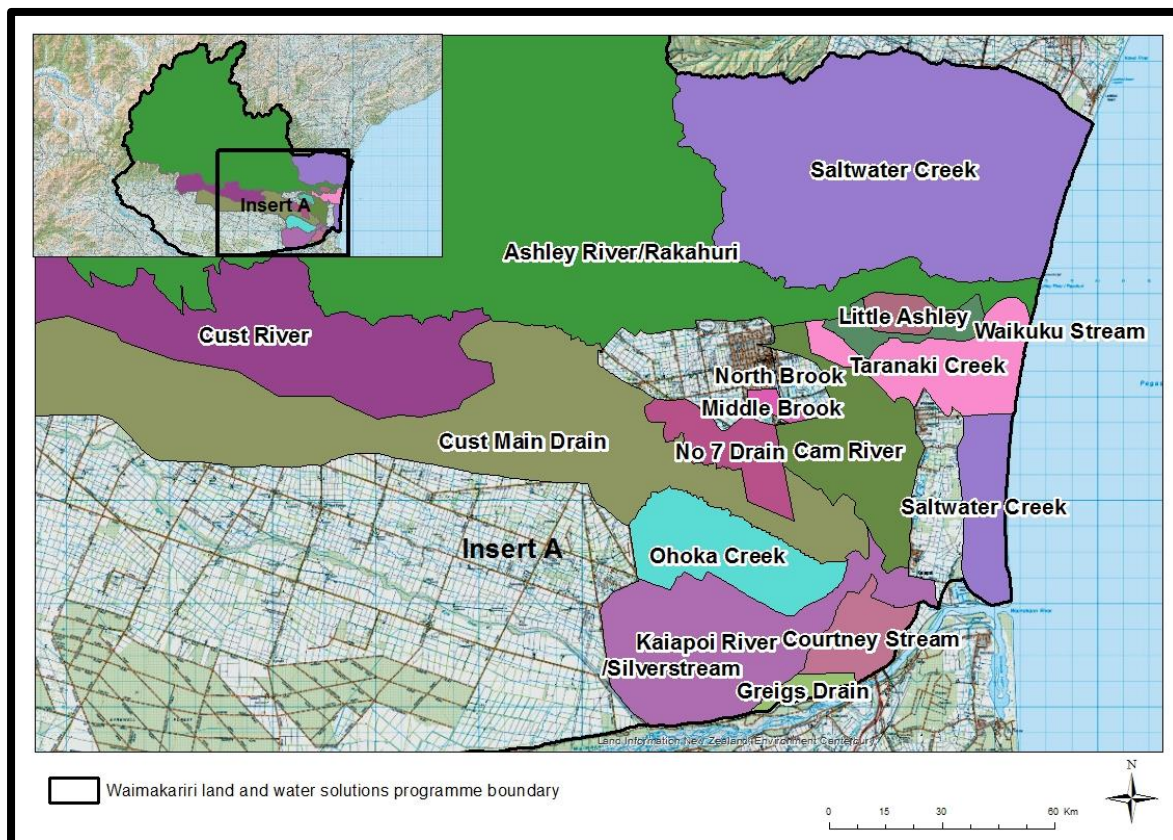


Figure 2: Selected SWAZ's within the Waimakariri zone analysed for this study

Table 2: Average water requirements (from Schedule WQN11, Natural Resource Regional Plan; except where indicated by a footnote)

Human and Stock type	Average (L/head/day)
Human ³	470
Dairy cattle	77
Beef cattle	50
Sheep	3
Deer	30
Pigs	12
Goats	3
Horses	61
Ostriches and Emus	77
Alpacas and Llamas	77
Poultry	0.33

LWRP permitted water use

We used a slightly different method to estimate LWRP permitted water use for GAZs and SWAZs. For the GAZs, we used an amended version of the ‘stage two calculations’ of Dodson and Lough’s (2013, page 20). The first thing we did in our study was to determine which properties were supplied water by the WDC, Waimakariri Irrigation Limited or were irrigated (which we assumed indicated they have access to a consented water take). We then excluded these properties from our analysis leaving the properties shown in Figure 3. We then counted the number of wells that may be used to abstract water as a permitted water use that were located on the properties in Figure 3, then multiple that number of wells by a daily volume. We used the values from Table 3 as estimates of daily permitted water use, instead of the lower 3,000 L/well/day as used by Dodson and Lough (2013). We used these figures because we felt it better represents the rules in the LWRP.

For SWAZs we counted the number of properties that bordered a river, not serviced by a stockwater or water scheme, and then applied the daily volumes values in Table 4. We used the 7 day Mean Annual Low Flows (7dMALF⁴) from Megaughin and Hayward (2016) where available (Appendix A). We did not use the LWRP maximum rates in our calculations because

³ This figure is the Canterbury average urban daily water use, taken from Dodson and Lough (2013).

⁴ 7 day Mean Annual Low Flow (7dMALF) is a hydrological statistic representing how low the flow gets in a typical year.

to stay within the rules, pumping at the maximum rate will have to cease between 33 to 83 minutes (see Column F of Appendix A). And we think it is extremely unlikely that all takes will operate at the same time.

We believe our estimates are a fair representation of LWRP permitted water use in the Waimakariri zone.

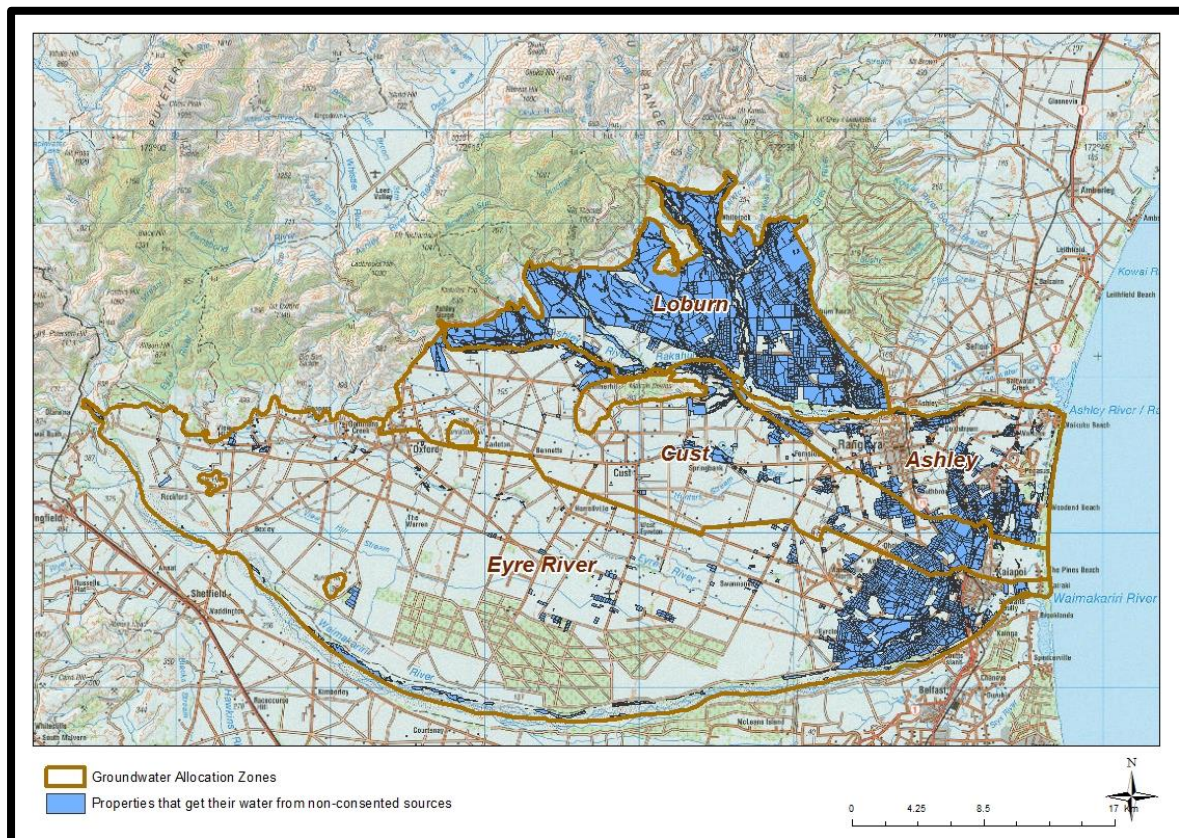


Figure 3: The properties we identified that are not supplied water by the WDC, an irrigation scheme, or by another consented activity

Table 3: Groundwater permitted water use rules (from Rule 5.113 and Rule 5.114)

Waterbody	Site size	Maximum rate (L/s)	Maximum volume per day (m ³ /day)
Groundwater	Less than 20 ha	5	10
Groundwater	More than 20 ha	5	100

Table 4: Surface water permitted water use rules (from Rule 5.111 and 5.112)

Water body	7dMALF	Maximum rate (L/s)	Maximum daily volume (m ³ /day)
River	Undefined	5	10
River	< 100 L/s	0.5	2
River	100 - 500 L/s	2	10
River	500 L/s - 10 m ³ /s	5	20
River	10 - 20 m ³ /s	5	50
River	> 20 m ³ /s	5	100
Artificial watercourse	NA	5	10
Lakes	NA	5	50

Results

RMA permitted water use

Our estimates of RMA permitted water use by GAZs are shown in Table 5 and Figure 4. Our estimates show that RMA permitted water use is a small percentage of the groundwater allocation limits. This is because a large part of the Eyre and Cust GAZ are serviced by a Waimakariri District Council (WDC) stockwater scheme and parts by WDC urban water schemes (Figure 5); Ashley GAZ have a number of WDC urban water supplies including Rangiora; Loburn GAZ is dominated by dryland sheep and beef with low stocking rates and part of this GAZ is serviced by the Loburn Irrigation Company, and also Hurunui District Council rural water scheme⁵.

Dodson and Lough (2013) calculated and also asked all the Canterbury TAs, what percentage of the population was serviced by their water schemes: in the Waimakariri District it was between 80 to 88% of the population and in the Hurunui District it was 89% of the population. We believe these survey results support the findings presented here.

Our estimates of RMA permitted water use by SWAZ are shown in Figure 6 and Appendix B. Our estimates show that RMA permitted water use represents less than 3% of the 7dMALF's (Appendix B) which is within the gauging error margin of 10%. Again, these results seem reasonable because these catchments are partial serviced by TA water schemes and an irrigation scheme (Figure 5). As our results of RMA permitted water use are within gauging error, we do not believe permitted water use needs to be considered when evaluating the allocation regimes for these rivers.

⁵ Ashley Rural Water Scheme - <http://www.hurunui.govt.nz/assets/Documents/Utilities/new-water-pamphlets/Ashley-water-supply-updated.pdf>

Table 5: Our estimate of RMA permitted water use per GAZ in the Waimakariri zone

GAZ	Estimate of RMA permitted water use (L/s)	Groundwater allocation limit (L/s) ⁶	RMA permitted water use versus Groundwater allocation limit
Eyre River	21.2	3142	1%
Cust	21.2	1785	1%
Ashley	17.4	932	2%
Loburn	7.8	1294	1%

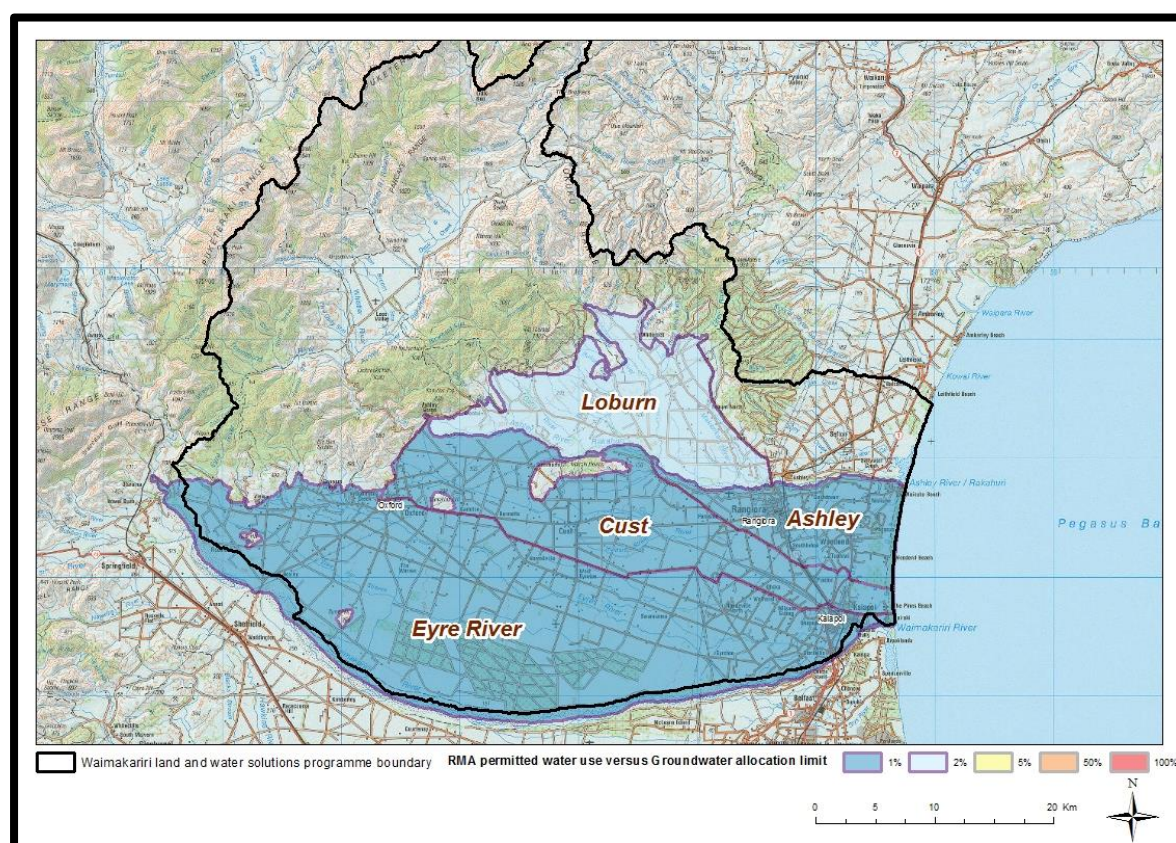


Figure 4: Our estimate of RMA permitted water use as a percentage of the groundwater allocation limit per GAZ

⁶ This value was calculated by dividing the annual groundwater allocation volume by 365 days.

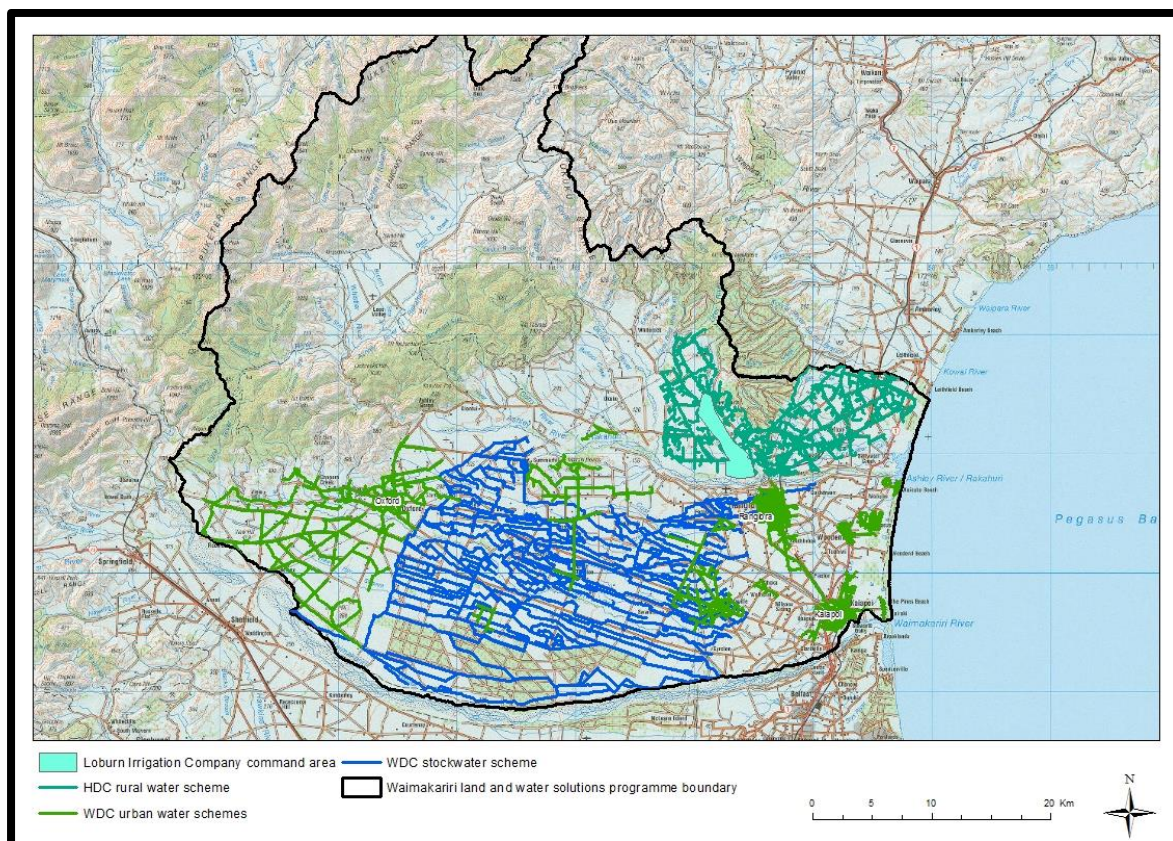


Figure 5: Distribution of Waimakariri District Council (WDC) urban water schemes, Hurunui District Council (HDC) rural water scheme and WDC stockwater scheme. And the command area of the Loburn Irrigation Company

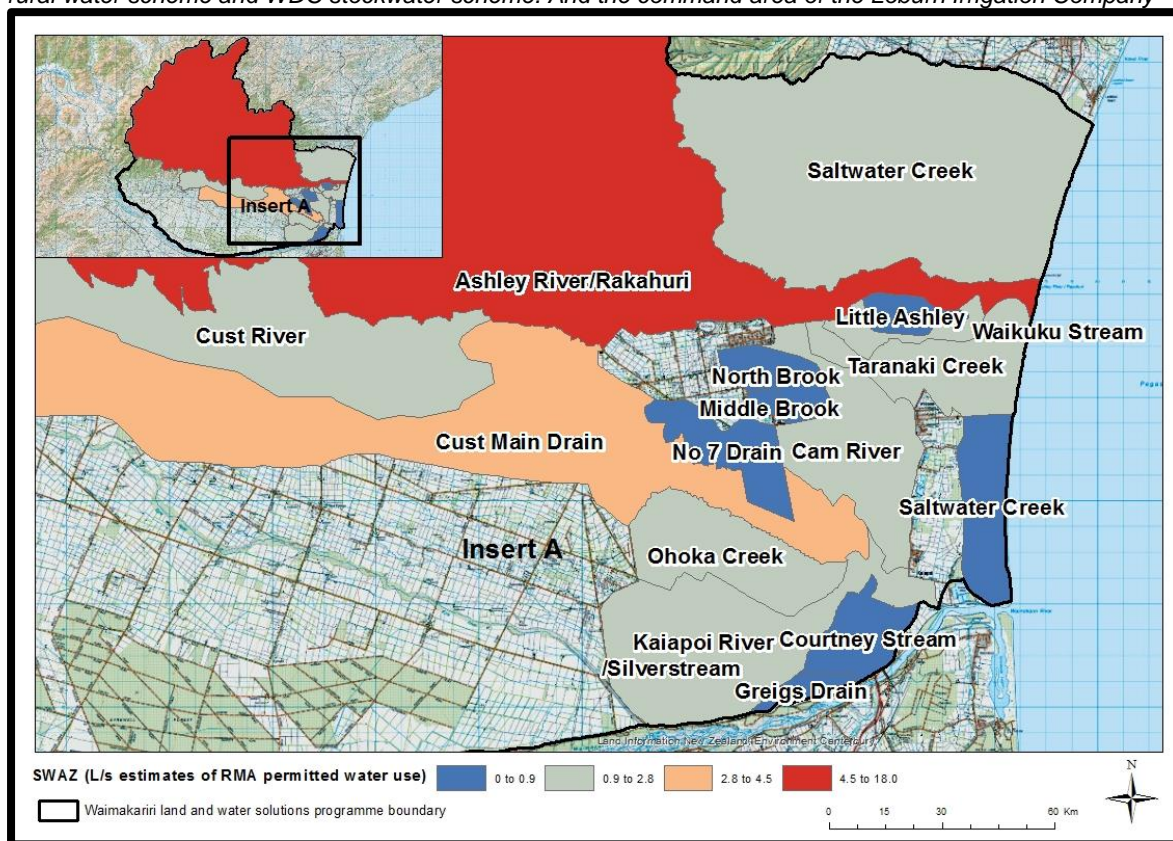


Figure 6: Our estimate of RMA permitted water use as L/s per SWAZ

LWRP permitted water use

Our estimates of LWRP permitted water use by SWAZ are shown Appendix B. Our estimates show that LWRP permitted water use are all less than 5% of the 7dMALF's (where available).

Our estimates of LWRP permitted water use by GAZ are shown in Table 6. Our estimates range from 4 to 8% of the groundwater allocation limits. From Figure 3 and Figure 5 we see that much of the area is serviced by a TA water or stockwater scheme or access to a consented water take.

Table 6: Our estimates of LWRP permitted water use

GAZ	Number of properties on properties less than 20 ha	Number of properties on properties greater than 20 ha	Estimate of LWRP permitted water use (L/s)	Groundwater allocation limit (L/s)	RMA permitted water use versus Groundwater allocation limit
Eyre River	680	20	123	3142	4%
Cust	299	18	77	1785	4%
Ashley	394	9	73	932	8%
Loburn	167	42	76	1294	6%

Discussion

For this study we have estimated permitted water use in the Waimakariri zone. We believe our estimates are fair representations of permitted water use in the zone.

We found that RMA permitted water use represents less than 3% of allocation limits for GAZ's and 7dMALF's for rivers. And that LWRP permitted water use is less than 8% of allocation limits for GAZ's and less than 5% of 7dMALF's for SWAZ's. As such we conclude that the cumulative size of permitted water takes are small, particularly when compared to the total amount of consentable water available. We also found that RMA permitted water use estimates are within the gauging error of margin, and therefore we conclude that it shouldn't be necessary to consider them while reviewing existing surface water allocation regimes.

Many of the locals tell us that some permitted water users are using more than they are entitled to under the RMA or LWRP. This is very likely to be true. We suspect that a small percentage of permitted water users are not complying the rules, probably because they don't know the rules or are purposely disregarding them.

References

- Dodson, M., and Lough, H., 2013. *Estimating permitted water use in Canterbury*. Environment Canterbury Technical Report No. R13/76. ISBN 978-1-927257-98-2.
- Megaughin, M., and Hayward, S., 2016. *Waimakariri land and water solutions programme: Hydrology Current State Report*. Report No. R16/68 ISBN 978-1-927210-99-4.

Appendix A: Key information per river

River name	7dMALF (L/s)	A allocation block size (L/s)	LWRP permitted take - maximum rate (L/s)	LWRP permitted take - maximum daily volume (m ³ /day)	Pumping time at maximum rate to consume the maximum volume (minutes) Column F	Rate required to pump maximum volume continuously for 24 hours (L/s)
Ashley River/Rakahuri	2,040	700	5.0	20	67	0.23
Cam River	1,194	700	5.0	20	67	0.23
Courtenay Stream	332	140	2.0	10	83	0.12
Cust Main Drain	492	690	2.0	10	83	0.12
Cust River	300	290	2.0	10	83	0.12
Greigs Drain	60	70	0.5	2	67	0.02
Kaiapoi River/Silverstream	1,350	1,000	5.0	20	67	0.23
Little Ashley	Undefined	172	5.0	10	33	0.12
Middle Brook	Undefined	30	5.0	10	33	0.12
No 7 Drain	Undefined	130	5.0	10	33	0.12
North Brook	Undefined	200	5.0	10	33	0.12
Ohoka Stream	505	500	5.0	20	67	0.23
Saltwater Creek	Undefined	408	5.0	10	33	0.12

River name	7dMALF (L/s)	A allocation block size (L/s)	LWRP permitted take - maximum rate (L/s)	LWRP permitted take - maximum daily volume (m³/day)	Pumping time at maximum rate to consume the maximum volume (minutes) Column F	Rate required to pump maximum volume continuously for 24 hours (L/s)
Taranaki Creek	101	61	2.0	10	83	0.12
Waikuku Stream	355	460	2.0	10	83	0.12

Appendix B: Results of our analysis for SWAZ in the Waimakariri zone

River name	7dMALF (L/s)	Our RMA permitted water use estimate (L/s)	RMA permitted water use versus 7dMALF	Our LWRP permitted water use estimate (L/s)	LWRP permitted water use versus 7dMALF
Ashley River/Rakahuri	2,040	17.9	1%	31.9	2%
Cam River	1,194	2.4	0%	8.3	1%
Courtenay Stream	332	0.4	0%	1.5	0%
Cust Main Drain	492	4.5	1%	8.8	2%
Cust River	300	1.3	0%	7.8	3%
Greigs Drain	60	0.2	0%	0.2	0%
Kaiapoi River/Silverstream	1,350	1.7	0%	10.0	1%

River name	7dMALF (L/s)	Our RMA permitted water use estimate (L/s)	RMA permitted water use versus 7dMALF	Our LWRP permitted water use estimate (L/s)	LWRP permitted water use versus 7dMALF
Little Ashley	Undefined	0.1		0.5	
Middle Brook	Undefined	Not estimated		0.9	
No 7 Drain	Undefined	0.2		2.9	
North Brook	Undefined	0.9		1.9	
Ohoka Stream	505	2.8	1%	19.7	4%
Saltwater Creek	Undefined	2.0		30.0	
Taranaki Creek	101	1.6	2%	3.2	3%
Waikuku Stream	355	1.7	0%	2.0	1%