AQUALINC RESEARCH LIMITED

Update of Water Allocation Data and Estimate of Actual Water Use of Consented Takes

2009–10

Prepared for Ministry for the Environment

Report No H10002/3

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AQUALINC RESEARCH LIMITED

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EXECUTIVE SUMMARY

The purpose of this report is to present a summary of the approach and results of the 2010 survey of freshwater take consents for both consumptive and non-consumptive uses. It follows on from two similar studies completed in 1999 and 2006. It also includes estimating the actual abstraction volumes of the consented takes.

Consent Numbers

There are currently over 20,500 consented freshwater takes in New Zealand of which around 200 consents are for non-consumptive takes such as for hydro generation. As shown in Figure ES-1, 68% of consents are for groundwater takes, 29% for surface water (run-of-river) and 3% for storage takes. The highest water use category is irrigation at 75% followed by drinking water supply (includes reticulated municipal and community supply for commercial and industrial consumption) and industry with 9% each. While stock water supply accounts for 6% of consent numbers the vast majority of takes for stock water are non-consented as they fall within permitted activity and/or reasonable use criteria (Figure ES-2).

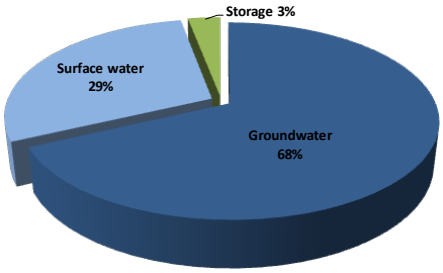

Figure ES-1: Distribution of consents by source

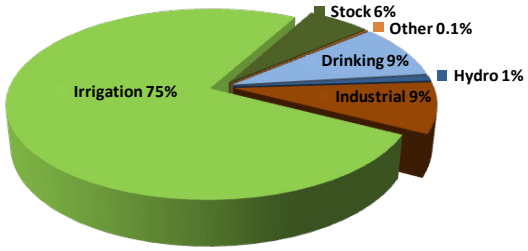

Figure ES-2: Distribution of consents by use

Weekly Water Allocations

The total weekly allocation is 3,946 million cubic metres per week (Mm^3/week) of which 757 Mm^3/week are for consumptive use. This consumptive volume is sufficient to fill up 30 Olympic-sized swimming pools every minute. Surface water sources (run-of-river and storage) contribute to 80% of this allocation and 20% from groundwater (Figure ES-3). Irrigation and hydro generation account for majority of consumptive allocations with 46% and 41%, respectively (Figure ES-4). Industrial, drinking water supplies and stock water account for 6%, 5% and 2%, respectively.

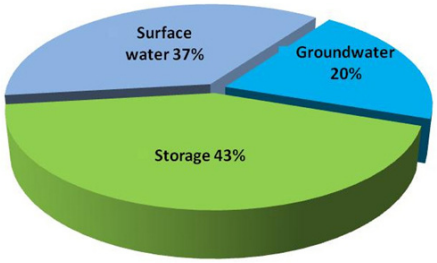

Figure ES-3: Distribution of weekly consumptive allocation by source

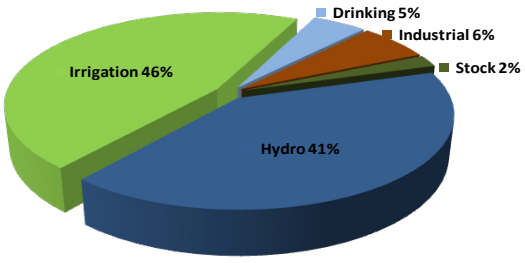

Figure ES-4: Distribution of weekly consumptive allocation by use

Most of the hydro generation takes are non-consumptive in New Zealand. These takes, after hydro-power generation, generally return water back to the source and can be used again by other water users. However, one hydro generation consent in Southland takes water from the Waiau River and discharges out to sea that prevents other water users from using the resource. The consented weekly allocation for this take is 308 Mm^3/week that accounts for over 40% of the total weekly consumptive allocation nationally. Figure ES-5 and Figure ES-6 show the national weekly consumptive water use distribution excluding the Southland hydro generation take by source and use, respectively. Irrigation accounts for 78% of allocations.

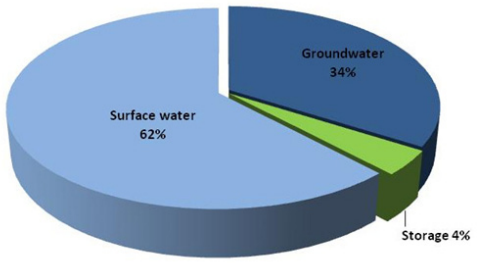

Figure ES-5: Distribution of weekly consumptive allocation excluding hydro generation takes by source

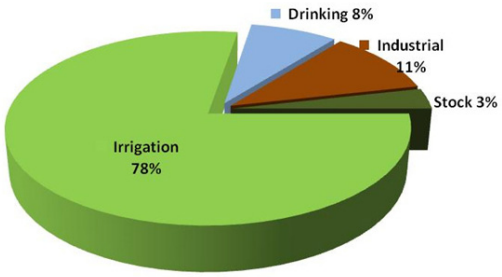

Figure ES-6: Distribution of weekly consumptive allocation excluding hydro generation takes by use

Regional Distribution of Weekly Water Allocation

Regional distribution of the weekly consumptive allocation shows 41% (313 Mm^3/week) of the national allocation is in Southland followed by 33% (249 Mm^3/week) in Canterbury. As shown in the Figure ES-7 there is a considerable variation between regions in the contribution of water from sources. While storage contributes a relative lower proportion of total water allocation for many regions, for Southland and Auckland it is the largest contribution. As mentioned above nearly 99% (308 Mm^3/week) of the consumptive allocation in Southland is for hydro generation.

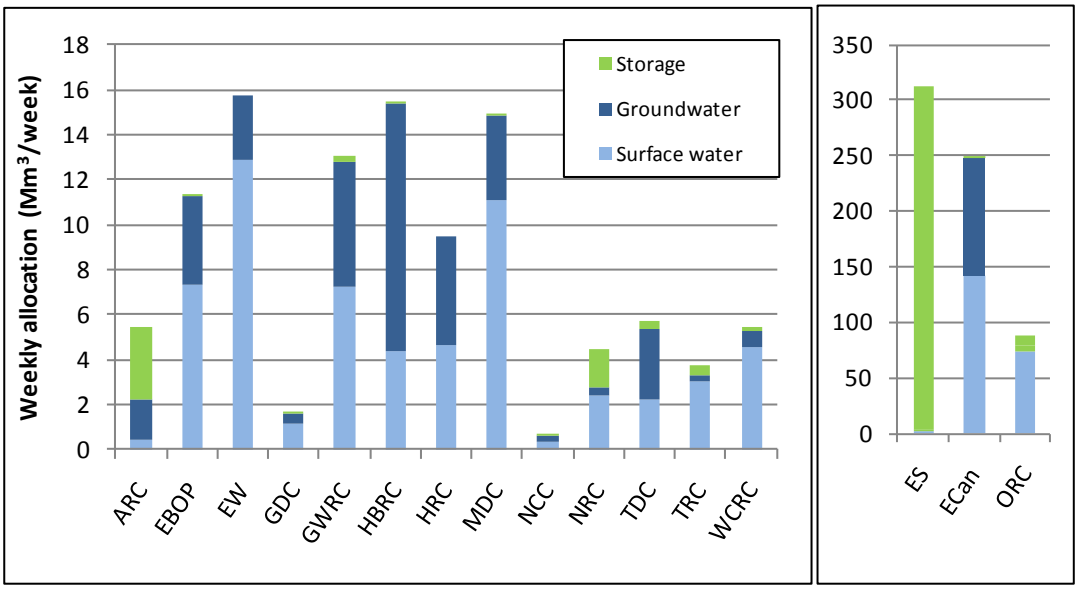

Figure ES-7: Regional weekly consumptive water allocation by source

Allocation Trends

Three water consent surveys (1999, 2006 and 2010) show that national weekly consumptive water allocations have increased by a third over the last 11 years (Figure ES-8). This data includes the 308 Mm^3/week hydro generation take in Southland. Excluding this hydro generation take, the national allocations have nearly doubled over the 11 years.

Some councils suggest that it is not accurate to compare the current data against 1999 data as the completeness of the records were poorer then and the methodologies now used to determine current allocation levels are more systematic than that of 1999. More accurate and comparable data in the 2006 and 2010 surveys illustrates that consumptive allocation excluding the Southland hydro generation take has increased by approximately 10% over the last four years. The largest increase is in Canterbury with a difference of 25 Mm^3/week (11%) between 2006–2010. The highest percentage increase has occurred in Horizons (51%) followed by Northland (41%).

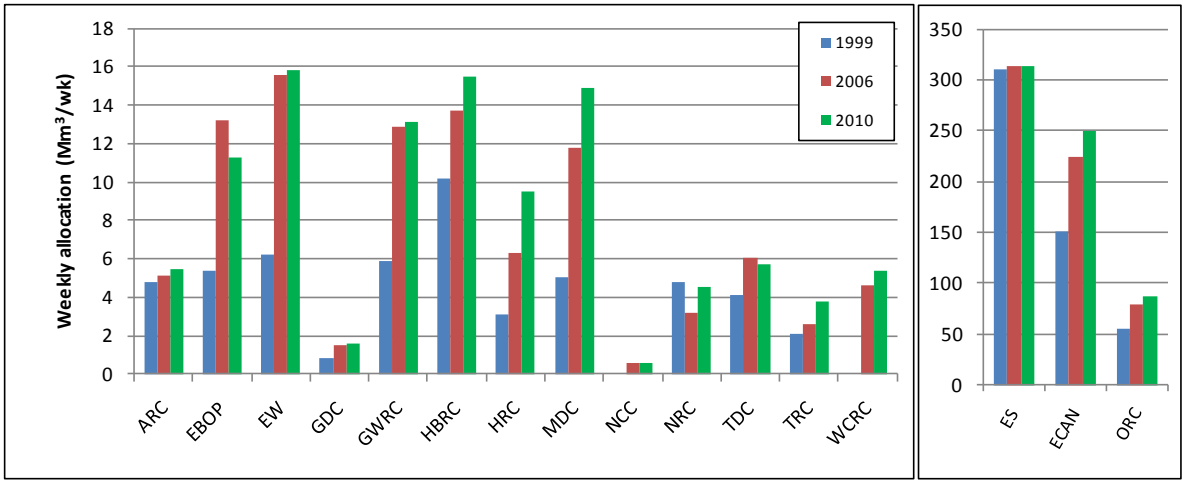

Figure ES-8: Regional weekly consumptive water allocation trends

Annual Allocations

The total annual allocation for consumptive use is nearly 27 billion cubic metres per year (Bm^3/year) which is equivalent to about 46% of the volume of Lake Taupo. However, approximately 16 Bm^3/year of this total is allocated for the consumptive hydro generation take in Southland (Figure ES-9). Excluding the hydro generation take, the annual allocations for Canterbury and Otago equate to 46% and 23%, respectively, of total other national consumptive allocation. The overall allocations including the non-consumptive uses account for 193 Bm^3/year.

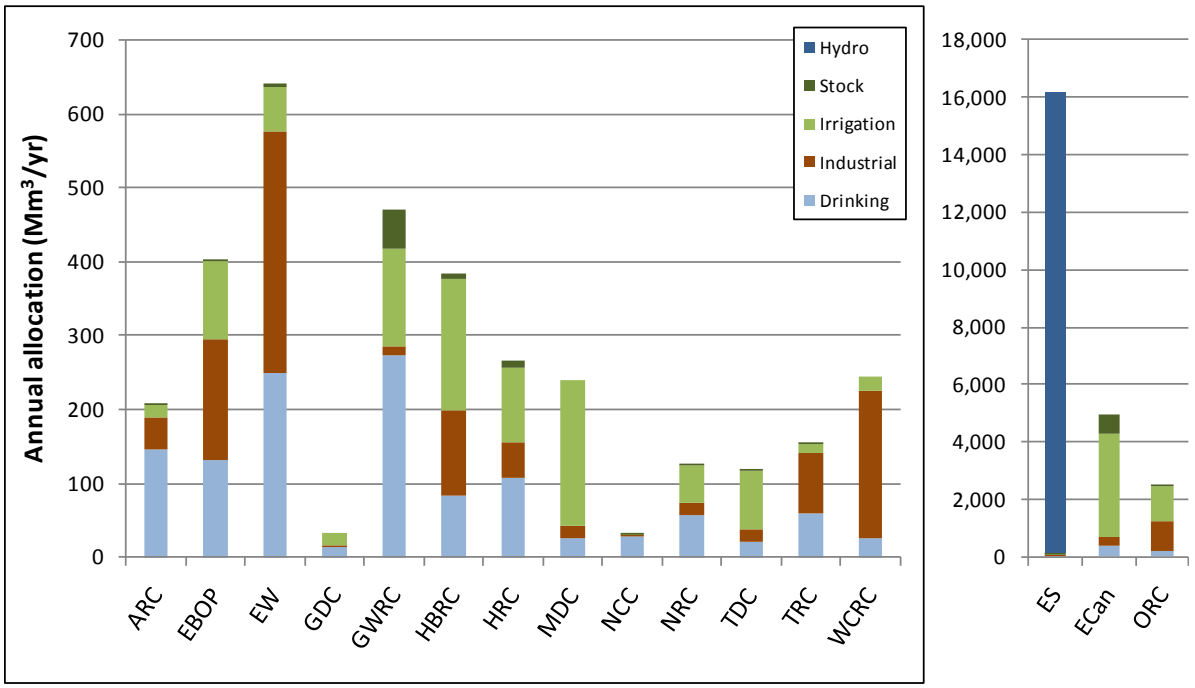

Figure ES-9: Annual consumptive water allocation by regions

Consented Irrigated Area

Total consented irrigated area in 2010 was over 1 million hectares. However, the 2007 NZ Statistics' census estimated that the irrigated area is likely to be significantly lower than the consented area at 0.6 million hectares. Regional authorities also reported that the actual irrigated area can be significantly lower than the consented area for some consents. As illustrated in the Figure ES-10, three quarters of the consented irrigated area is for pasture. However, it is general practice in some regions that water is authorised for multiple crops (i.e. pasture, viticulture, arable etc); therefore, distribution of the actual irrigated crops varies over time. The majority of the consented irrigated area is in Canterbury (63%) and Otago (16%).

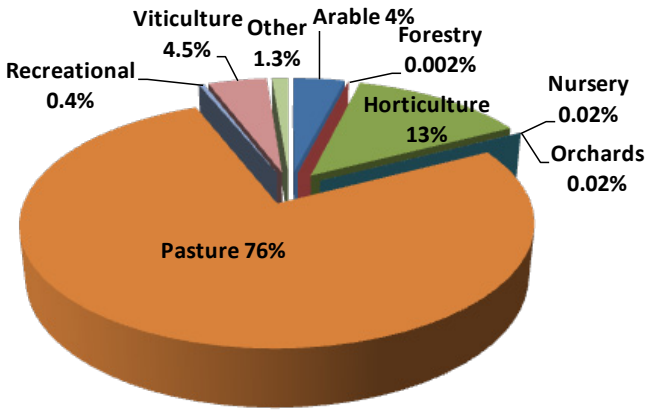

Figure ES-10: Consented irrigated area by crops (%) in 2010

The total consented irrigated area in 2006 was 940,000 hectares and has increased by 14% over the last four years. Figure ES-11 shows the growth in consented irrigated area for the 16 councils between 1999, 2006 and 2010.

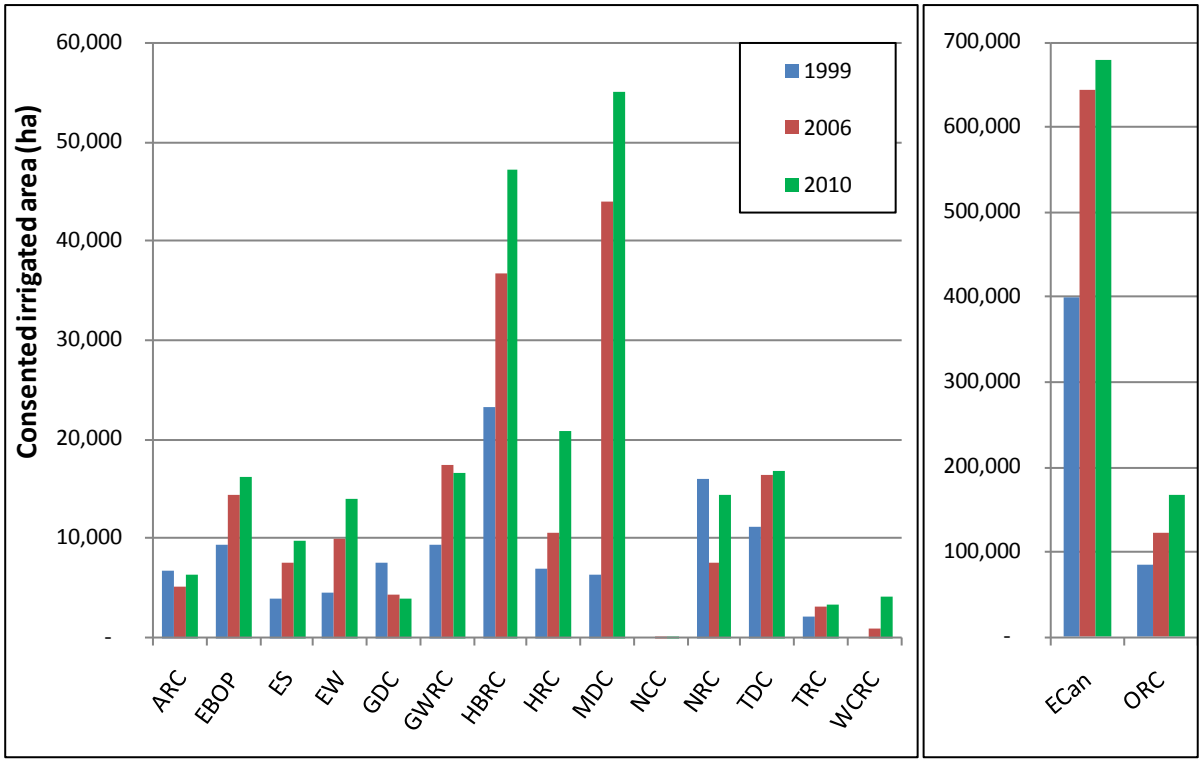

Figure ES-11: Consented irrigated area (ha) 1999, 2006 and 2010

Water Use

The estimated actual abstraction compared to the maximum consented volumes is 65%. As shown in Figure ES-12 the actual water use percentage is highest in Gisborne followed by Southland and Auckland regions. Most regions use less than 50% of the consented water indicating that the allocable resources are being under-utilised.

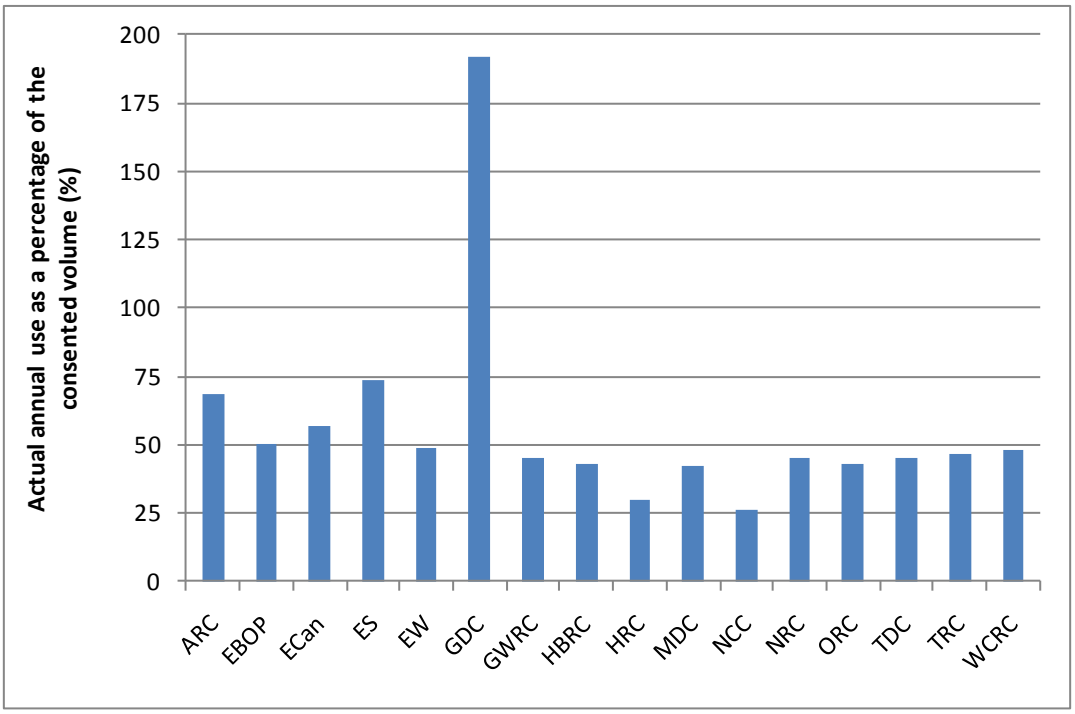

Figure ES-12: Annual water use by regions

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Aqualinc Research Limited would like to acknowledge the contributions of the 16 regional authorities: regional councils, unitary authorities and city councils. Their support was pivotal to completing this study. Specific thanks are extended to the following:

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- Environment Canterbury: Christina Robb and Marc Ettema
- Environment Southland: Karen Wilson, Steven Ledington, Dianne Elliotte and Rachel Brennan
- Environment Waikato: Edmund Brown
- Gisborne District Council: Jenna Wolter and Kerry Hudson
- Greater Wellington Regional Council: Stephen Thawley and Juliet Milne
- Hawke's Bay Regional Council: Paul Barrett and Darryl Lew
- Horizons Regional Council: Raelene Hurndell, Jon Roygard and Chris Veale
- Marlborough District Council: Val Wadsworth, Rachel Reveley, Alan Johnson, Pere Hawes, Christine Leslie, Chris James and Michael Ede
- Nelson City Council: Sarah Capenerhurst, Mandy Bishop and Debra Bradley
- Northland Regional Council: Susie Osbaldiston and Emily Walker
- Otago Regional Council: Sarah Ibbotson, Claire Sims, Marian Weaver and Selva Selvarajah
- Tasman District Council: Joseph Thomas
- Taranaki Regional Council: Andres Jaramillo, Fred McLay and Fiona Jansma
- West Coast Regional Council: Nita Smith and Simon Moran

LIST OF ABBREVIATIONS

ARC	Auckland Regional Council
EBOP	Environment Bay of Plenty
ECan	Environment Canterbury
ES	Environment Southland
EW	Environment Waikato
GDC	Gisborne District Council
GWRC	Greater Wellington Regional Council
HBRC	Hawke's Bay Regional Council
HRC	Horizons Regional Council
MDC	Marlborough District Council
MfE	Ministry for the Environment
NCC	Nelson City Council
NRC	Northland Regional Council
ORC	Otago Regional Council
TDC	Tasman District Council
TRC	Taranaki Regional Council
WCRC	West Coast Regional Council

1 INTRODUCTION

As part of its National Environmental Reporting Programme, the Ministry for the Environment (MfE) reports on a core set of 22 environmental indicators, plus supporting information, across 10 domains. Fresh water is one of those domains. There are currently five fresh water quality indicators but only one indicator focused on water quantity – *the volume of water allocated (via resource consent) to consumptive uses.* This indicator is a proxy for abstraction and is strictly a 'pressure' rather than 'state' indicator.

The purpose of this project is to update national indicator data on freshwater allocation in New Zealand. Similar national indicator data was compiled for MfE by Lincoln Environment in 1999 (LE, 2000) and by Aqualinc Research Ltd in 2006 (Aqualinc, 2006). This current update involved collating regional council resource consent data in a way that allows comparison with results reported in 1999 and 2006.

The geothermal allocations were not included in this project. Therefore, the term "water" used in this report refers to freshwater.

This project also included estimating the actual abstraction volumes of the consented takes using a 5% sample of larger takes (where possible consents with take rates greater than 50 litres per second were used).

1.1 Project Scope

The scope of the project is two-fold:

Task 1: To update regional and national freshwater allocation estimates and evaluate with previous 1999 (LE, 2000) and 2006 (Aqualinc, 2006) estimates to get a comparison over three points in time. The databases include both non-consumptive takes (e.g. hydro generation) and consumptive takes.

Task 2: To estimate the actual abstraction volumes of the consumptive consented takes.

The project included details of all existing water consents and any expired ones for which a replacement application has been made. New applications which have not yet been granted were not included.

1.2 Related Work

MfE has conducted two previous similar studies to obtain national indicators of water allocation. Brief summaries of the two projects are given in following subsections.

1.2.1 Information on Water Allocation in New Zealand - 1999

This project included a survey of water allocations at regional and national level as at 1999 (LE, 2000). In addition to allocations, it also included elements evaluating economic returns to irrigation water and regional allocation policy.
The analysis of consumptive water use allocation showed that:

- Seventy percent (70%) of the consents for surface water takes;
- Seventy seven percent (77%) of the weekly consumptive allocations were for irrigation, and 16% and 7% for public water supply and industry respectively;
- Fifty eight percent (58%) of allocations were in the Canterbury region;
- The consented irrigation area was 600,000 hectares, of which 400,000 and 84,000 hectares were in Canterbury and Otago, respectively; and
- Irrigated area had increased by 55% per decade for the past 30 years.

1.2.2 Snapshot – Water Allocation in New Zealand - 2006

This project presented a summary of the 2006 survey of water take consents for consumptive use (Aqualinc, 2006). It also included information from national water accounts, agricultural census data, and an analysis of surface water flows.

A summary of project findings includes:

- Sixty six percent (66%) of the almost 20,000 consented water takes were from groundwater, 29% from surface water (run-of-river), 3% from storage (dams and lakes) and 2% from geothermal sources;
- Consented irrigation takes accounted for the greatest number of consents (78%) followed by industry (11%) and public water supply (9%);
- The total weekly consumptive allocation rate was 679 cubic metres per second (m^3/s). Two thirds of this allocation was from surface water sources and a third from groundwater;
- Irrigation accounted for 78% of all weekly consumptive allocations, public water supply for 11%, industrial use for 9% and stock water for 2%;
- Fifty five percent (55%) or 373 m^3/s of the weekly allocation was for Canterbury, and 18% (125 m^3/s) for Otago;
- The total annual allocation was close to 10 Bm^3/year; and
- Total consented irrigated area is 970,000 hectares, of which 66% was in Canterbury and 14% in Otago.

The 2006 survey had been completed using the best available information at the time of the study and calculations of the non-listed consent records based on certain assumptions. However, as described in Sections 3.2.1 and 4.2, almost all the councils have now improved their consent databases and some of the 2006 non-listed records are now available. Comparison of the estimated values in 2006 against the now available data shows that some of the estimated records are different to the actual values. In addition, comparison of 2006 and 2010 consent records showed that there are a few inaccuracies in some 2006 data and they are now corrected. Those

inaccuracies and estimated values in 2006 databases were corrected in consultation with the regional authorities during this current study and reported in Sections 3 and 4. Therefore, it is recommended that the 2006 Snapshot report (Aqualinc, 2006) is not used in isolation; however, reading it in conjunction with this report would provide more accurate information.

1.3 Study Units

The following units for flow, volume and area have been adopted:

- Flow rate
  - Litres per second (ℓ/s)
  - Cubic metres per day (m^3/d)
  - Cubic metres per week (m^3/wk)
  - Cubic metres per year (m^3/yr)
  - Cubic metres per summer (October to March) (m^3/season)

- Volume
  - Cubic metres (m^3)
  - Million of cubic metres (Mm^3)
  - Billion of cubic metres (Bm^3)

- Area
  - Hectare (ha)

2 METHODOLOGY

The approach and methodologies adopted for the two project tasks (refer to Section 1.1) are outlined in the following sections.

2.1 Task 1: National Water Allocation Estimates

This task, updating the regional and national water allocation estimates, was the main objective of the overall project. The 2010 allocation data (as at January 2010) has been compared against two previous stock takes, 1999 (LE, 2000) and 2006 (Aqualinc, 2006), to get allocation trends over three points in time. The database compilation of the consented water takes included data from all 16 regional authorities (12 regional councils and 4 unitary authorities).

Task 1 of the project included the following steps:

1. Requesting consent information from councils, categorised by the fields given in Appendix A. The councils were also requested to include only existing consents and any expired ones for which a replacement consent application

had been made. New applications that had not yet been granted were not included.

2. Screening the data for gross errors, anomalies and inconsistencies. The screening included checking for the following:
    - Multiple entries of the consents;
    - Missing key fields for water source and primary use;
    - Missing allocation rates, volumes or irrigated area;
    - Inconsistencies between given allocations rates and volumes;
    - Inconsistencies between allocated volumes and irrigated areas;
    - Consent commencement and expiry date for the status of the consent;
    - Location, i.e, the consent's take fell within council boundaries.
3. Resolution of the data errors and uncertainties through consultation with regional council staff.
4. Agreement with relevant regional councils on the methodologies for calculation of the missing/not-listed consent records such as allocation rates, volumes and irrigated area.
5. Calculation of the missing flow rates and volumes using the methods agreed with each council. This also included calculation of "summer" season[1] allocation volumes.
6. Calculation of the non-listed irrigated areas for the irrigation consents using the consented volumes and irrigation application depths as agreed with regional councils.
7. Conversion of map references that are in different projections to the NZMG projection.
8. Compilation of the regional consent records to the project database structure that is given in Table A1 of Appendix A.
9. Determination of allocation levels (i.e. demand pressure) by use type for each region.
10. Update of 1999 and 2006 databases to a field structure that is common with the 2010 database for easier comparison.
11. Update/correct the 2006 database with new available information, where necessary, in consultation with the councils.
12. Comparison of the 2010 data with the updated 2006 data to identify the trends.
13. Consultation with councils to finalise and get approval for the compiled 2010 final database, comparison between the 2006 and 2010 datasets, and comments on 1999 dataset.

[1] The "summer" season months are October to March

2.2 Task 2: Estimation of the Actual Abstraction Volumes

The goal of this task was to estimate regional and national actual water use compared with the consented takes. This task was initiated after the compilation of the consent database in Task 1, which showed that although consented consumptive takes with allocations of less than 50 ℓ/s account for 83% (16,764) of all consents nationally, they only account for 11% of total weekly allocations (85 Mm^3/week). Conversely consents with take rates of 50 ℓ/s or greater represent 17% of consents (3,533) but account for 89% of the total weekly allocations (672 Mm^3/week).

The estimation of the actual water use was completed using a 5% sample of water use records with take rates of 50 ℓ/s or more as this sample represents more than 89% of the national consumptive water use. The following approach was adopted in this task:

- Determination of the sample size, i.e. 5% of the takes of 50 ℓ/s or greater.
- Distribution of the sample size between regions based on the regional distribution of the consents that have a rate of 50 ℓ/s or greater.
- Distribution of the regional sample size for different take rates (take-rate groups), e.g. 50-100 ℓ/s, 100-500 ℓ/s, 500-1,000 ℓ/s and >1,000 ℓ/s.
- Distribution of each take-rate group for different uses (municipal, irrigation, industrial, stock water etc). Select at least one consent from each group for each use type to identify variation in regional water use for different take sizes and use types.
- Selection of the sample using the consented takes for which water meters have been installed. This process included giving higher priority to larger take-rate groups, if the regional sample size is too small to select consents from all the take-rate groups for each use type.
- Selection of at least one consent with a long water use record, if the duration of the record length was known, for each use type for each region to identify the temporal variation in water demand.
- Obtain water use data (water meter records) for the above sample. If data was not available for the selected consents or the record length was short, the councils were requested to replace the consent with another that had sufficient data for the project.
- Calculation of the actual annual water use as a percentage of the consented volumes for the sample, and obtain the average percentage water use for different use types and take rate categories.
- Application of the findings of the sample analysis to other consents with the same use types and within the same take-rate groups to obtain regional water use estimates.
- Comparison of the results with already completed studies on actual water use.

3 WATER ALLOCATION

This section presents the findings of the regional and national water allocation estimates, which was the main objective of the study. The key findings of consent numbers and allocations are given in the following subsections. Further details are listed in Appendix C, and the regional summaries are given in Appendix D.

The term 'surface water' in the following subsections refers to consents and allocations from run-of-river and the term 'storage' from dams and lakes.

3.1 Consent Numbers

There were a total of 20,505 water take consents in the January 2010 consent database of which 20,298 were consumptive takes. Figure 3-1 to 3-4 show the distribution of consents (nos.) in total and by regional authority for primary source and use. The key observations are:

- Groundwater takes account for 68% of national consents (Figure 3-1). Run-of-river and storage consents are 29% and 3%, respectively. However, electronic consent data for some councils do not specify the takes from storage separately and denote only as a surface water consent. Therefore, the actual consent numbers from storage could potentially be slightly higher than 3%.
- Irrigation accounts for 75% of all consents (Figure 3-2).
- Canterbury region has the highest proportion of consents accounting for 30% (6,186) of the total number (Figure 3-3).
- Groundwater use in terms of numbers is higher in most regions (Figure 3-3). However, the number of surface water consents are higher in Otago, where a large number of mining water rights exist, and are also higher in Northland and Taranaki.
- Figure 3-4 shows the distribution of consents by use for each council; irrigation consents account for the largest proportion of consents in most regions (apart from Southland and West Coast).

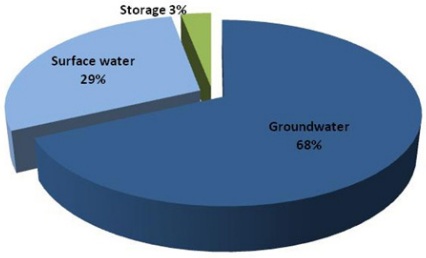

Figure 3-1: Consent distribution by source

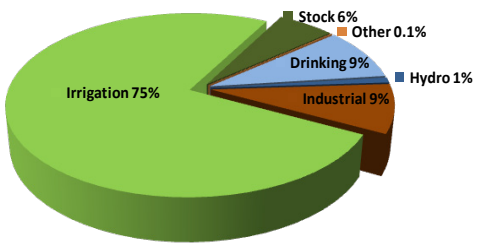

Figure 3-2: Consent distribution by use

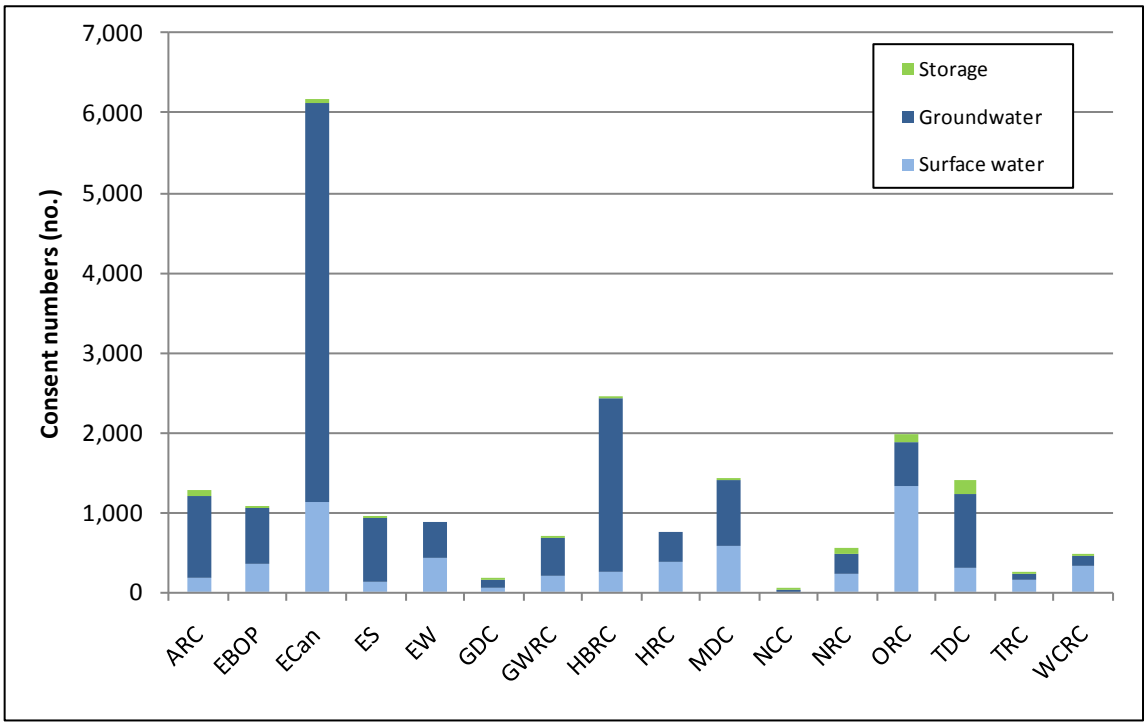

Figure 3-3: Distribution by consents by regions and source

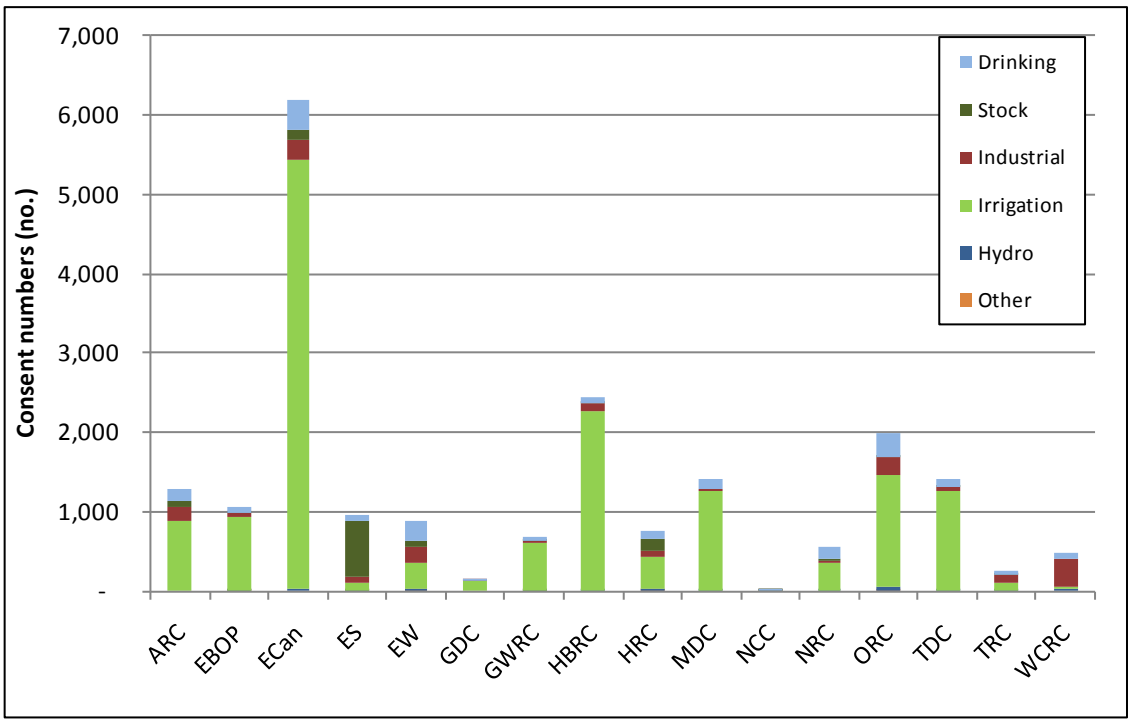

Figure 3-4: Distribution by consents by regions and use type

Further information on consent numbers, such as national distribution is shown in Appendix C.

3.2 Water Allocation

This section presents the weekly and annual allocations. Further details along with summaries for summer (October to March) water use and non-consumptive use are given in Appendix C. The water allocation summaries by regions are given in Appendix D.

3.2.1 Assumptions and Limitations

As shown in Appendix B, the councils use different parameters to manage water allocation. Where database field records were not listed (e.g. instantaneous rate, daily or annual volumes), the following general methods have been applied to calculate the field.

- The instantaneous rate was calculated using the given daily volume assuming 24-hour continuous pumping (i.e. rate (ℓ/s) x 60 x 60 x 24 /1000 = daily volume (m^3/day)).
- The daily volume was calculated from instantaneous rate for 24-hour continuous pumping, or weekly volume / 7 days.
- The weekly volume was calculated as daily volume x 7 days.
- The annual volumes for drinking[2], stock water and industrial were calculated as weekly volume x 52 weeks. The annual volumes for the irrigation takes were calculated as agreed with the relevant regions - the parameters included peak weekly volume x 16 weeks, peak daily volume x 85 days, peak daily volume x 120 days, peak daily volume x 155 days.
- The maximum annual allocation for the frost protection was based on maximum of 30 days water use.

The above calculations were prompted due to unavailability of the requested consent data. Whilst the calculations are based on the methods as agreed with councils, some councils indicate that the methods can potentially overestimate the annual quantities. One of the major limitations of this analysis is where the annual allocation volume is missing and so was calculated using listed peak daily or weekly rates for the primary use type. However, in reality most consents are permitted to use water for multiple activities such as domestic purposes, irrigation and stock water. If the primary water use of the consent is drinking, the annual allocation was calculated assuming 365 days abstraction, although the actual abstraction for the irrigation component of the take may be non-existent during winter months. Conversely if the primary use is irrigation, the annual estimates (that is estimated for certain period of the year, e.g. 16 weeks take) can be an underestimate of the potential annual limit.

It is not practical nor within the scope of this national scale stock-take project to estimate the accurate annual allocation limits for each consent. It is also not possible for most councils to easily and accurately identify the allocation limits for different use types for a single consent using existing electronic database structures. Therefore, the estimates presented in this project are indicators only, and should be interpreted and used cautiously.

[2] Drinking supply includes water for reticulated municipal and community supply for domestic, commercial and industrial consumption.

There are some special case hydro generation consents where water is abstracted from one catchment and discharged into another. As the consented water is being exported out of the first catchment, it is a consumptive use for the catchment. However, on a national scale the water is still available for use, so it is considered a non-consumptive consent. One of the examples of this type of consent is the abstraction of water from the Whanganui River catchment for the ***Tongariro Power Scheme***. This scheme is consented to abstract 29.7 m^3/sec from the Horizons Region and discharge the water into the Lake Taupo catchment in the Waikato Region. Albeit it in a different catchment and region as the water is still available for use on a national basis such takes are considered as non-consumptive for this study.

3.2.2 Results

Table 3-1 lists a summary of weekly consented allocations for consumptive use (Mm^3/week) by region, and the percentage of allocation from each primary source.

Key points to note are:

- Total weekly allocation for consumptive water use is 757 Mm^3/week;
- Weekly allocation from overall surface water sources accounts for 80%. Storage contributes 43% (326 Mm^3/week) and run-of-river surface water accounts for 37% (279 Mm^3/week);
- Groundwater weekly allocation is 20% (153 Mm^3/week);
- Southland weekly allocation accounts for 41% (313 Mm^3/week) nationally followed by Canterbury 33% (249 Mm^3/week) and Otago 12% (88 Mm^3/week);
- Nearly 99% (308 Mm^3/week) of the consumptive allocation in Southland is for a hydro generation consent that takes water from the Waiau River and discharges out to sea.

Table 3-1: Weekly water allocation for consumptive use by region and source

Region	Allocation (Mm^3/week)	Groundwater (%)	Storage (%)	Surface water (%)
ARC	5.5	33.2	59.6	7.2
EBOP	11.3	35.0	0.2	64.8
ECan	249.3	42.4	0.8	56.8
ES	313.0	1.0	98.6	0.5
EW	15.8	18.5	-	81.5
GDC	1.6	27	0.9	72.1
GWRC	13.1	42.3	1.9	55.8
HBRC	15.5	71.3	0.5	28.1
HRC	9.5	51.5	-	48.5
MDC	14.9	25.0	0.1	74.9
NCC	0.6	33.3	0.02	66.7
NRC	4.5	9.8	37.7	52.5

ORC	87.8	5.6	9.8	84.6
TDC	5.7	55.7	6.1	38.2
TRC	3.8	6.5	13.8	79.7
WCRC	5.4	14.4	2.6	82.9
Total	**757.1**	**20.2**	**43.0**	**36.8**

Annual consented allocations for consumptive use (Mm3/year) by council and primary source are presented in Table 3-2. The total annual allocation is approximately 26.9 Bm3/year, of which over 61% (16.5 Bm3/year) is from storage sources, 26% (7 Bm3/year) from direct takes from surface water and 12% (3.3 Mm3/year) from groundwater. Figure 3-5 shows that there is considerable variation between regions in the contribution of water from sources. While storage contributes a relative lower proportion of total water allocation for many regions, for Southland and Auckland it is the largest contribution.

As noted previously the higher annual consumptive water use in Southland is predominately due to the Waiau River hydro generation take that accounts for over 99% (16,039 Mm^3/year) of the total regional water allocation.

Table 3-2: Annual water allocation for consumptive use by region and source

Region	Allocation (Mm^3/year)	Groundwater (%)	Storage (%)	Surface water (%)
ARC	207	22.6	73.6	3.8
EBOP	402	27.6	0.3	72.1
ECan	4,991	40	0.7	59.3
ES	16,182	0.5	99.1	0.4
EW	641	17	-	83
GDC	32	31.3	2.3	66.5
GWRC	472	41.2	1.8	57.1
HBRC	383	73.9	0.3	25.8
HRC	265	47.8	-	52.2
MDC	238	34.9	0.1	65
NCC	29	33.6	0.02	66.4
NRC	126	13.7	33	53.3
ORC	2,455	6.9	8.8	84.3
TDC	116	60.7	4.9	34.5
TRC	155	7.4	17.4	75.2
WCRC	243	14.2	2.8	83
Total	**26,936**	**12.4**	**61.4**	**26.2**

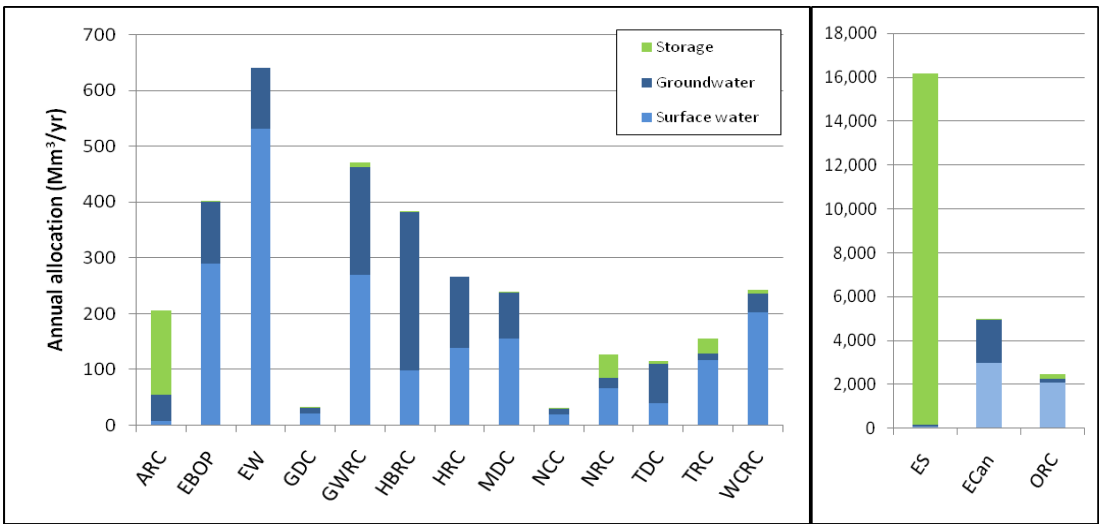

Figure 3-5: Annual water allocation for consumptive use by region and source

Weekly allocation for consumptive uses by region for primary use types is listed in Table 3-3. Irrigation accounts for 46% of the weekly allocation (348 Mm^3/week), hydro generation for 41% (308 Mm^3/week), drinking supply[3] for 4.8% (37 Mm^3/week), industry for 6.4% (48 Mm^3/week) and stock water for 2.1% (16 Mm^3/week). Irrigation accounts for more than 80% of weekly allocations in the Canterbury, Gisborne, Hawke's Bay, Marlborough and Tasman regions. Allocations to stock water only represented those takes requiring consent approval, however it should be borne in mind that the vast major of stock takes are permitted activities under the RMA and regional plans.

[3] Drinking supply includes water for reticulated municipal and community supply for domestic, commercial and industrial consumption.

Table 3-3: Weekly water allocation for consumptive use by region and primary use

Region	Allocation (Mm^3/week)	Drinking (%)	Industrial (%)	Irrigation (%)	Stock (%)	Hydro (%)
ARC	5.5	56.6	19.6	23.2	0.6	-
EBOP	11.3	22.1	27.8	50.1	0.05	-
ECan	249.3	3.3	2.5	88.8	5.4	-
ES	313.0	0.2	0.3	0.8	0.1	98.6
EW	15.8	31.6	43.4	24.4	0.7	-
GDC	1.6	17.7	0.4	81.9	-	-
GWRC	13.1	40.7	1.9	49.5	7.9	-
HBRC	15.5	8.7	9.5	81	0.8	-
HRC	9.5	21.7	9.8	66.6	1.9	-
MDC	14.9	3.2	2.3	94.5	-	-
NCC	0.6	97.9	0.4	1.6	0.03	-
NRC	4.5	26.2	6.6	66.7	0.5	-
ORC	87.8	4.5	24.0	71.4	0.1	-
TDC	5.7	7.0	5.3	87.6	0.01	-
TRC	3.8	30.3	41.1	28.1	0.5	-
WCRC	5.4	9.3	70.2	20.4	-	-
Total	**757.1**	**4.8**	**6.4**	**46.0**	**2.1**	**40.7**

Table 3-4 and Figure 3-6 present annual allocations for consumptive uses by region for primary use types. Hydro generation accounts for nearly 60% of the annual consumptive allocation nationally. Figure 3-6 shows that the annual allocations for irrigation in Canterbury, Marlborough and Tasman are relatively higher than that for the other regions. Irrigation accounts for only 21.5% of annual allocation nationally. This lower proportion compared to the weekly allocation (46%) represents the seasonal nature of water use for irrigation that occurs generally around the summer months. Comparison of Figure 3-6 and Figure 3-7 confirms this seasonal nature of the irrigation water use with similar annual and summer irrigation allocation volumes. Table C 24 in Appendix C shows that summer season allocation for irrigation accounts for 34% of the overall allocation during this period which is over 50% higher than the annual allocation (21.5%). Annual consented allocations for drinking and industrial are 6.8% and 9.2%, respectively.

Table 3-4: Annual water allocation for consumptive use by region and primary use

Region	Allocation (Mm^3/year)	Drinking (%)	Industrial (%)	Irrigation (%)	Stock (%)	Hydro (%)
ARC	207	70.2	21.7	7.6	0.5	-
EBOP	402	32.4	40.8	26.7	0.1	-
ECan	4,991	7.7	6.4	71.8	14.1	-
ES	16,182	0.2	0.3	0.2	0.1	99.1
EW	641	38.7	51.2	9.3	0.8	-
GDC	32	45.6	1.0	53.4	-	-
GWRC	472	58.0	2.5	28.2	11.3	-
HBRC	383	21.5	30.7	46.1	1.7	-
HRC	265	40.4	18.1	37.9	3.6	-
MDC	238	10.3	7.5	82.1	-	-
NCC	29	99.0	0.4	0.5	0.03	-
NRC	126	45.6	12.4	41.0	0.9	-
ORC	2,455	7.9	43.1	48.8	0.2	-
TDC	116	18.0	13.7	68.3	0.03	-
TRC	155	38.6	52.4	8.3	0.7	-
WCRC	243	10.8	81.8	7.3	-	-
Total	**26,936**	**6.8**	**9.2**	**21.5**	**3.0**	**59.5**

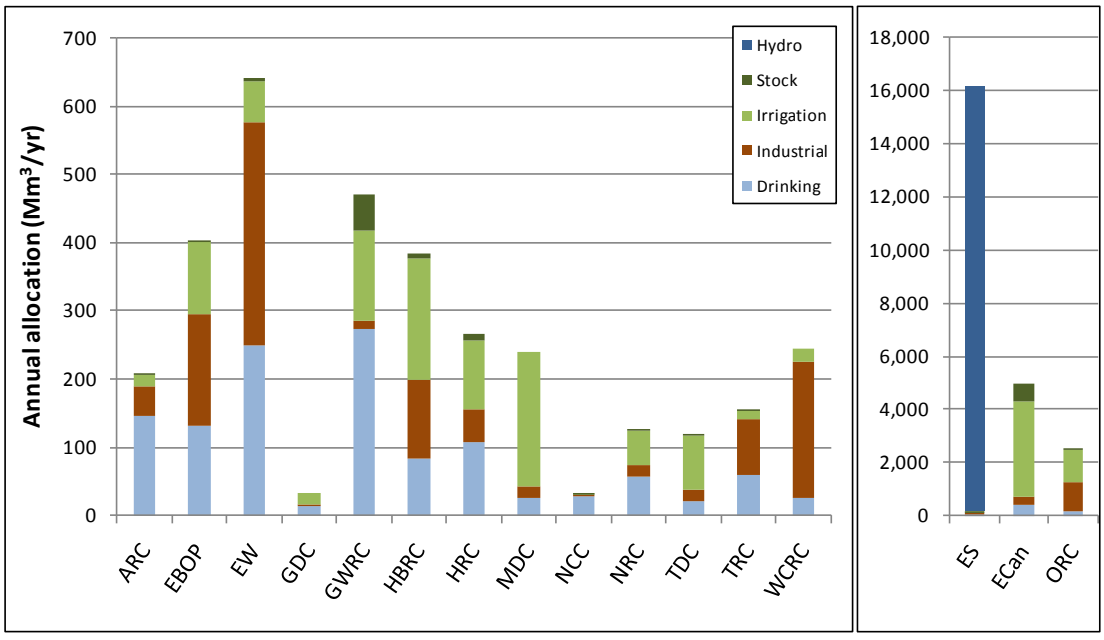

Figure 3-6: Annual water allocation for consumptive use by region and primary use

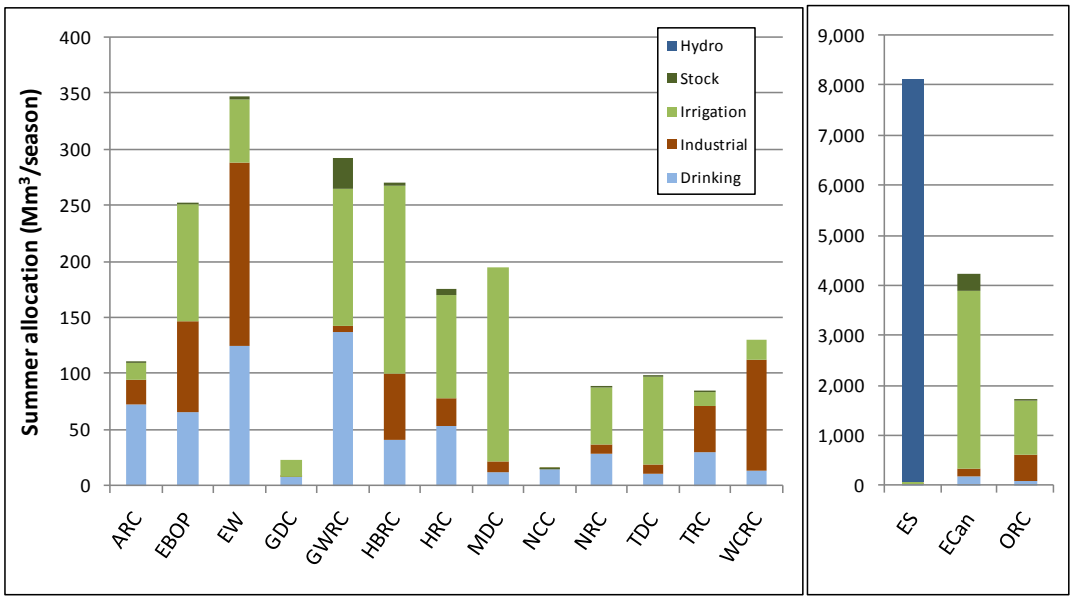

Figure 3-7: Summer season water allocation for consumptive use by region and primary use

3.3 Comparison and Trends

One of the objectives of the study is to evaluate the current estimates with previous 1999 (LE, 2000) and 2006 (Aqualinc, 2006) estimates to get a comparison over three points in time. This comparison has been completed for consumptive water uses only.

Table 3-5 and Figure 3-8 show the estimated consented weekly allocations for 1999, 2006[4] and 2010. The 1999 survey was based on information from 14 councils (West Coast and Nelson were not included). Comparing 2006 and 2010, the overall weekly allocations have increased by 6% from 715 to 757 Mm^3/week. This data includes 308 Mm^3/week hydro generation take in Southland. Excluding the Southland hydro generation take, the weekly consumptive allocation has increased by approximately 10% over the last four years. The largest increase is in Canterbury with a difference of 25 Mm^3/week (11%) between 2006–2010. The highest percentage increase has occurred in Horizons (51%) followed by Northland (41%).

[4] Some of the calculated records in 2006 dataset were updated with the available new information in 2010 for this assessment in consultation with the councils. Therefore, the values reported in this section vary from the 2006 report (Aqualinc, 2006). Please refer to Section 1.2.2 for further clarifications.

Table 3-5: Comparison of weekly allocations by region in 1999, 2006 and 2010

Region	Weekly allocation (Mm^3/week)		
	1999	**2006**	**2010**
ARC	4.8	5.1	5.5
EBOP	5.4	13.2	11.3
ECAN	151.1	224.5	249.3
ES	309.9	312.9	312.9
EW	6.2	15.5	15.8
GDC	0.8	1.5	1.6
GWRC	5.9	12.9	13.1
HBRC	10.2	13.7	15.5
HRC	3.1	6.3	9.5
MDC	5	11.8	14.9
NCC	-	0.6	0.6
NRC	4.8	3.2	4.5
ORC	54.5	79.3	87.8
TDC	4.1	6.0	5.7
TRC	2.1	2.6	3.8
WCRC	-	4.6	5.4
Total	**567.9**	**713.7**	**757.1**

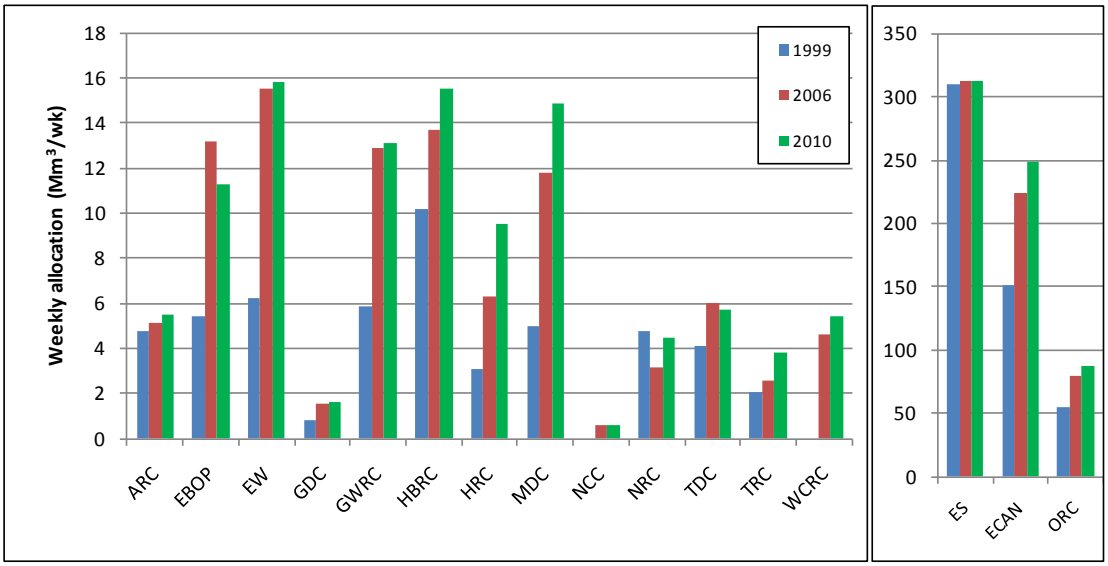

Figure 3-8: Regional weekly consumptive water allocation trends

Table 3-6 lists the estimated weekly consented allocation by source. As described in Section 3.1, storage is not separated from the run-of-river surface water source for some councils. Therefore, it is advisable to combine the surface water and storage

together for comparison. Over the past four years the allocation increase in groundwater is over 12% and that of surface water is less than 5%.

Table 3-6: Comparison of weekly allocation by source in 1999, 2006 and 2010

Source	Weekly allocation (Mm^3/week)		
	1999	**2006**	**2010**
Groundwater	78.8	136.4	152.9
Surface water	172.7	240.3	278.8
Storage	316.4	337.0	325.4
Total	**567.9**	**713.7**	**757.1**
Note: West Coast Regional Council and Nelson City Council were not included in the 1999 survey			

4 IRRIGATED AREAS

This section provides information on consented irrigated area by region. The irrigated area recorded in the compiled consent database was obtained either from the consent information provided by the councils or by calculation using the listed daily or weekly allocation and estimated irrigation application depths, where the irrigated area was not provided.

For the irrigated area calculation, the daily irrigation application depths for different crops such as pasture, horticulture and viticulture were suggested by the respective councils. However, in the absence of better estimates, application depths of 5.7 mm/day for pasture and 4.7 mm/day for horticulture were used in agreement with council staff. The application depths used in this calculation are conservative estimates and assumed to be representative for the whole region. However, as described in Section 3.2.1, abstractions for multiple uses are common under many resource consents. Hence, estimating the irrigated area using the above application depths and allocated volumes where a consent is used for multiple purposes can over-estimate the irrigated area.

It should be noted that the irrigated areas listed in this study are the consented values and not the actual irrigated areas. Some councils reported that the actual irrigated area or the land area developed for irrigation can be significantly lower than the consented areas. As an example, the consented area for viticulture is estimated to be approximately 34,000 ha in Marlborough, however, the actual planted area is approximately 24,500 ha.

4.1 Consented Irrigated Area

Table 4-1 lists the estimated regional consented irrigated areas along with percentage of area by water source. The total consented area is estimated to be in the order of 1.1 million hectares, with 51% supplied from surface water, 46% from groundwater

and 3% from storage. The consented irrigated area within the Canterbury region accounts for nearly two thirds of the area nationally.

Table 4-1: Consented irrigated areas by region

Region	Consented area (ha)	% area	Groundwater (%)	Storage (%)	Surface water (%)
ARC	6,264	0.6	66.0	11.7	22.3
EBOP	16,222	1.5	48.5	0.1	51.4
ECan	680,128	63.2	55.1	0.8	44.1
ES	9,819	0.9	90.9	0.8	8.3
EW	14,083	1.3	28.3	-	71.7
GDC	3,925	0.4	30.0	-	70.0
GWRC	16,631	1.5	59.0	2.9	38.1
HBRC	47,157	4.4	74.5	0.8	24.7
HRC	20,891	1.9	52.9	-	47.1
MDC	54,991	5.1	30.2	0.2	69.7
NCC	28	0.003	8.2	-	91.8
NRC	14,394	1.3	6.9	26.0	67.1
ORC	167,739	15.6	4.1	11.5	84.4
TDC	16,721	1.6	50.0	12.6	37.5
TRC	3,367	0.3	7.2	1.0	91.8
WCRC	4,143	0.4	16.2	0.7	83.1
Total	**1,076,502**	**100**	**45.5**	**3.0**	**51.4**

Table 4-2 lists the consented area by crop types. The highest proportion of area (76%) is pasture, followed by horticulture (13%). However, it is general practice in some regions that water is authorised for multiple crops (i.e. pasture, viticulture, arable etc); therefore, distribution of the actual irrigated crops varies over time.

Table 4-2: Consented irrigated areas by crop type

Region	Consented area (ha)	% of total area	Arable (%)	Forestry (%)	Horticulture (%)	Nursery (%)	Orchards (%)	Pasture (%)	Recreational (%)	Viticulture (%)	Other/unspecified (%)
ARC	6,264	0.6	0	0	66.7	0	3.4	18.5	11.5	0	0
EBOP	16,222	1.5	0	0	53.4	0	0	44	1.2	0	1.4
ECan	680,128	63.2	4.6	0	7.8	0	0	86.8	0.2	0.3	0.3
ES	9,819	0.9	0.2	0	4.6	0	0	93.6	1.6	0	0
EW	14,083	1.3	0	0	28.5	0	0	68.9	2.6	0	0
GDC	3,925	0.4	100	0	0	0	0	0	0	0	0
GWRC	16,631	1.5	3.3	0	3.4	0.1	0	78.7	4.8	5.7	4
HBRC	47,157	4.4	0	0	52.6	0.3	0	32.1	0.6	14.4	0
HRC	20,891	1.9	0	0	20	0	0	74.7	3.1	0	2.2
MDC	54,991	5.1	0	0	11.1	0	0	18.8	0.2	62	8
NCC	28	0.003	0	0	95.2	0	0	0	1.5	0	3.3
NRC	14,394	1.3	0.2	0	33.5	0	0	27.2	0	0	39.1
ORC	167,739	15.6	3	0	15.6	0	0	79.1	0	2.3	0
TDC	16,721	1.6	0	0	43.2	0	0	52.9	0	3.4	0.5
TRC	3,367	0.3	0	0	1.4	0.4	0	97.1	1	0	0
WCRC	4,143	0.4	47.7	0	0	0	0	52.3	0	0	0
Total	**1,076,502**	**100**	**4**	**0**	**13.4**	**0**	**0**	**76.4**	**0.4**	**4.5**	**1.3**

4.2 Limitations of the Assessment

A number of the listed consented irrigated areas were low in the 1999 (LE, 2000) and 2006 (Aqualinc, 2006) studies. Therefore, the areas were estimated in both years using a similar approach to that described for the 2010 survey (i.e. using given allocation volumes and estimated irrigation application depths). In comparison to previous years the availability of consented irrigated area data is higher in 2010. This has, as reported by some councils, resulted from concerted efforts to allocate water efficiently. To achieve efficient allocation most council use crop-soil-water balance models or other improved methods to estimate the reasonable allocation levels for each consent based on the given irrigated area. Therefore, most councils now record the irrigated area.

As described above, if the irrigated area is determined by calculation, it can potentially over-estimate the area due to use of the conservative irrigation application depths and allocated volumes that are used for multiple purposes. Therefore, as indicated by some councils, it is not reasonable to compare the areas between years as a high proportion of the irrigated areas were calculated in previous years.

Table 4-1 shows that 63% of the national consented irrigated area is within the Canterbury region. However, double counting of the consented irrigation area within the Canterbury region has been identified as a significant issue. The double counting has occurred as numerous properties (particularly within Mid Canterbury) are irrigated with surface water sourced from schemes such as the Mayfield-Hinds, Ashburton Lyndhurst, and Valetta irrigation schemes, however many of these properties also have consents for the take and use of groundwater for irrigating the same areas. In most cases groundwater is used as a 'top up' or 'back up' supply to the scheme water. As a result there are potentially thousands of hectares of irrigated area that have been double counted within the 2006 and 2010 consent databases, skewing the level of irrigation development within some areas. Resolving this issue would involve interviewing each property owner who irrigates with both scheme water and groundwater to determine the respective areas irrigated with scheme water and groundwater. However, such an approach is outside the scope of this project. Marlborough region also identified a similar issue of double counting the consented irrigation area if the electronic consent data is used directly; the council has now manually removed all the double counted areas.

It should be noted that consented irrigated area accrued per region is based on the consent location. While generally the irrigation command area falls within the consenting authority boundary, there are a small number of cross boundary transfers, most notably the lower end of the Lower Waitaki Irrigation Scheme and the Downlands Irrigation Scheme, both with takes from the Canterbury region but with part or all the command areas in the Otago region.

4.3 Comparison and Trends

Table 4-3 and Figure 4-1 show the estimated consented irrigated areas for the current study along with the previous two surveys in 1999 and 2006. The consented irrigated area in the 1999 survey was approximately 600,000 ha (for the 14 councils). The total

for the 2006 survey[5] was for 940,000 ha. Between 2006 and 2010 the estimated consented area has increased by 133,000 ha (14%). However, as described in Section 4.2, it may not be accurate to compare the total consented areas by region between years. The number of available records for the actual irrigated areas varies between years and the calculation of areas for the consents where area is not listed tends to overestimate the area.

Table 4-3: Consented irrigated areas by region in 1999, 2006 and 2010

Region	Consented irrigated area (ha)		
	1999	2006	2010
ARC	6,833	5,150	6,264
EBOP	9,435	14,300	16,222
ECan	400,091	643,058	680,128
ES	4,000	7,545	9,819
EW	4,500	9,972	14,083
GDC	7,500	4,365	3,925
GWRC	9,273	17,372	16,631
HBRC	23,242	36,649	47,157
HRC	7,000	10,595	20,891
MDC[*a]	6,269	43,983	54,991
NCC	-	73	28
NRC	16,000[*b]	7,609	14,394
ORC[*c]	84,593	121,968	167,739
TDC	11,270	16,443	16,721
TRC	2,200	3,051	3,367
WCRC	-	979	4,143
Total	**592,206**	**943,111**	**1,076,502**

Note: This table should be read and interpret along with the limitations associated with estimating these areas as described in Section 4.2

[*a] MDC's 2010 consent database shows that the consented viticulture area is 34,000 ha, however, ground truthing the planted area shows the actual viticulture irrigated area is approximately 25,000 ha.

[*b] NRC's 1999 area could be a significant overestimate as it was entirely determined using calculations due to the unavailability of the actual area.

[*c] ORC data includes estimated areas of approximately 80,000 ha and 108,000 ha supplied from mining water rights in 2006 and 2010, respectively.

[5] The estimated irrigated areas in 2006 data were updated with the available actual irrigated areas in 2010 for this assessment in consultation with the councils

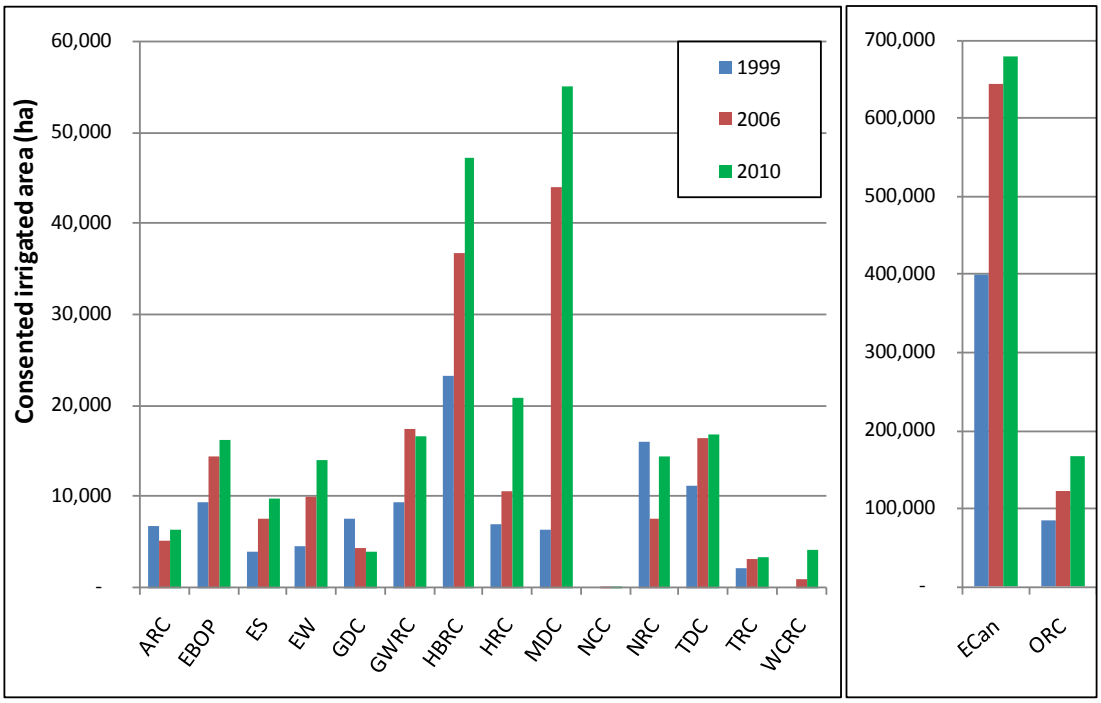

Figure 4-1: Consented irrigated area (ha) 1999, 2006 and 2010

Table 4-4 shows a comparison of irrigated area between the 2007 Agricultural Census (NZ Statistics, 2008) and the values determined from the consent database. The regional census data was compiled from the given irrigated area per territorial authority (TA). While TA boundaries generally correspond to regional boundaries, there are two notable exceptions; Franklin District which is bisected by the Auckland – Waikato regional boundary and Waitaki District which is bisected by the Canterbury – Otago boundary. In both cases the reported irrigated area within each regional boundary was calculated at the current distribution of irrigated area within the district and regional boundaries.

Table 4-4 shows that the estimated consented irrigated area is 77% higher than the agricultural census. This significant variation indicates the differences in approach in methodologies used in the two estimates. The census is based on the reported irrigated area (as per census questionnaire). It is a simple approach which is reliant on the accuracy and completeness of information supplied by landholders. The reported area probably reflects the area of installed irrigation and regularly irrigated. The consented irrigated area is as reported on the consent application or the calculated area based on peak water demand (from the consent database). Often the requested irrigated area in a consent application represents a potential gross irrigated area for a property and includes a factor for future development. It should also be noted the time difference between the two studies; some of the difference would be explained by the increase in irrigated area from the 2007 Stats data to 2010.

Therefore, it is reasonable to assume that the overall actual irrigated area is probably in the order of 80% of consented area. This also allows a factor for the area double counting issue described in Section 4.2.

Table 4-4: Comparison of irrigated areas in 2007 agricultural census and estimated consented areas in 2010 by region

Region	Irrigated area (ha)		% Difference
	2007 Census*	2010 consented area	
ARC	4,449	6,264	41%
EBOP	11,212	16,222	45%
ECan	394,518	680,128	72%
ES	7,606	9,819	29%
EW	16,586	14,083	-15%
GDC	2,328	3,925	69%
GWRC	12,963	16,631	28%
HBRC	25,629	47,157	84%
HRC	10,447	20,891	100%
MDC	26,688	54,991	106%
NCC	390	28	-93%
NRC	8,715	14,394	65%
ORC	72,756	167,739	131%
TDC	10,580	16,721	58%
TRC	3,375	3,367	0%
WCRC	1,373	4,143	202%
Total	**609,615**	**1,076,502**	**77%**

* estimated using NZ Statistics' 2007 irrigable land census by Territorial Authority

5 ACTUAL ABSTRACTION LEVELS

This section presents an analysis of Task 2 of the study: an estimation of actual abstractions of the consented takes. As outlined in Section 2.2, the analysis is based on the water meter data supplied by the councils.

It should be noted that this assessment is based only on consented water takes for consumptive use. For the purposes of this study, water takes that are almost exclusively returned to source are deemed as non-consumptive use.

The 2010 national consent database shows that there are 3,534 consents that are permitted to take 50 ℓ/s or more, as shown in Table 5-1. Whilst these consents account for 17% of all consumptive takes nationally, they represent 89% of weekly allocations, that is 672 Mm^3/week of the 757 Mm^3/week national allocation. As 89% of allocations can be represented from 17% of the consents, a 5% sample from these consents (take of 50 ℓ/s or more) was selected for this study. Where there were no water meter records available for takes of 50 ℓ/s or more for a certain use type,

smaller takes were used for the analysis. In addition approximately 15 other consents for take rates less than 50 ℓ/s were also included in the analysis from the regions where number of consents are higher (e.g. ECan and HBRC).

Table 5-1: National consent summary by take rate category and allocation

Take rate category (l/s)	Consents			Allocation		
	No	%		Mm^3/week	%	
<50	16,764	83%		84.9	11%	
50-75	1,385	7%		42.4	6%	
75-100	744	4%		33.3	4%	
100-500	1,255	6%	17%	109.8	14%	89%
500-1,000	89	0.4%		30.4	4%	
>1,000	60	0.3%		456.4	60%	
Total	**20,297**	**100%**		**757.1**	**100%**	

The regional distribution of the selected sample using the methodology described in Section 2.2 is given Table 5-2.

Table 5-2: Regional distribution of the selected water meter sample for the annual water use assessment

Region	Selected number of water meter records (No.)
ARC	6
EBOP	12
ECan	50
ES	10
EW	12
GDC	5
GWRC	8
HBRC	20
HRC	10
MDC	10
NRC	9
ORC	20
TDC	7
TRC	8
WCRC	9
Total	**196**

5.1 Assumption and Limitations

The estimation of the actual water use was conducted using a few assumptions and simplifications. Actual water use as a percentage of the consented volume was determined using a 5% sample of consents. Whilst for the higher water use regions such as Canterbury the percentage water use was determined by averaging records for a significant number of consents, assessment was limited to a few consents for some regions where water use is relatively low (Appendix E).

It was assumed councils use the same protocols and approaches for determining allocation limits for similar use categories throughout the region. Therefore, the average water use percentage calculated for a single use type (using the sample) was used to estimate the overall water use percentage of the category.

Activities and proportion of water use for different purposes vary between municipal and community supplies. Urban municipals primarily supply water for domestic, commercial and industrial consumption. Whereas rural community supplies mainly cater for domestic and stock water. Estimates of drinking water use were therefore based on multiple water meter records, if sufficient water meter records were available. It was assumed that the average water use percentage calculated using multiple water use records would provide a reasonable average regional water use for municipal and community supplies.

Water meter records were not available for some use types within some regions. In such cases the water use percentages from a geographically suitable region was used to calculate the actual water use. For instance, Nelson water use data was estimated using Tasman water use percentages. The assumptions used for each council are given under the regional summary section in Appendix E.

5.2 Stock Water Use

Although the primary use of more than 1,200 consents is stock water, only two water meter records are available in two regions. In the absence of water use records for the consented takes, stock water use was estimated using Lincoln University Dairy Farm (LUDF) water use records (SIDDC, 2010). As the objective of this study is to estimate the actual water use for the consented takes, these water use records need to be assessed against the consented volumes. However, as often is the case in most consents, LUDF's water take consent is used for multi-uses such as irrigation, stock water and dairy shed use. Hence, it is not possible to compare the water use records against the consented volumes.

Regional authorities generally use regional guidelines to determine the allocation volumes for the stock water component of multi-use consents. Therefore, regional water allocation guidelines from Environment Canterbury (ECan), the region within which the LUDF is located, was used to determine the consented volumes of the stock water (ECan, 2007).

As shown in Appendix E, daily stock water requirements vary for different stock types. To be conservative, this analysis is based on water requirements for dairy cows. It is also assumed that dairy cows are in lactation for 10 months of the year. Daily

water requirements for dairy cows in lactation and dry are 70 and 45 litres/head/day, respectively (ECan, 2007). Comparison of LUDF water use data (SIDDC, 2010) and ECan guidelines (ECan, 2007) shows that the annual average stock water use is approximately 60% of the suggested guidelines value.

Previous research findings show that large variations in the estimates for average and peak stock water use occur due to differences in animal breed, age, lactation status, feeding regimes, and environmental and climate factors (Rout, 2003). Harrington (1980) recommends that the design capacity of stock water systems be based on the stock held on farm during the January to March period and that a peak daily water consumption rate of 70 litres/head/day for milking dairy cows be used. This is supported by ANZECC (2000), EW (2007) and the Lincoln University Farm Technical Manual (2003).

Although actual stock water requirement guidelines can vary between regions, for simplicity and based on the recommendations of the above listed research, it is assumed that ECan's daily stock water requirements can be adopted for all the regions. Therefore, for the regions where the actual water use records for stock water are not available, it is assumed that actual average annual water use is 60% of the consented allocation.

It should be noted that the percentage stock water use from the water races can be significantly lower. There are a number of water races constructed for stock water use around the country. For instance, Sinton (2008) reported that a network of approximately 6,500 km long permanently flowing open water races to supply stock water to farms exist across the Canterbury Plains. These open races are highly inefficient with only 2-4% of water taken actually required by stock (Fish and Game, 2008). However, no detailed studies were available to quantify the actual water use.

5.3 Results

The actual water use of the consented takes was estimated using the methodology described in Section 2.2 and the selected sample as described in Section 5.

Table 5-3 presents a summary of estimated actual water use against the consented volumes for the consumptive takes by region. Regional summaries by different use types are given in Appendix E.

Water meter data used for this assessment varies in timeframes and scales. As shown in Appendix E, the length of the water meter records is limited for some regions. However, it appears that most of the councils are in the process of implementing wider scale monitoring programmes and would be better equipped for similar studies in the future. Given that there are a limited number of longer water use records for each use type, the estimates given in this study may not accurately represent the temporal variations in water demand due to climate variations and many other factors. Therefore, these estimates should be treated as approximate indicators only and not as accurate long-term averages.

The annual consented and estimated actual water use volumes along with percentage of water use by region are given in Table 5-3 and Figure 5-1. The regional overall

water use estimates that were calculated for different use types and take rate categories are presented in Appendix E. The average national water use is estimated to be 65% of consented volume which is a generally accepted percentage of use. However, the overall value is influenced by the higher water use in Southland (74%) that accounts for over 60% of the national annual allocation. The higher percentage water use in Gisborne, as shown in Appendix E is due to higher drinking water use above the consented volume[6]. Water use for some councils is lower and depicts under-utilization of the resource. As described above, data availability in terms of number of consents and length of records are limited, therefore it is recommended that the assessment of water use be further investigated particularly for the low use regions.

Table 5-3: A summary of consented and estimated actual annual water use for the consumptive takes by region

Region	Consented annual volume (Mm^3/year)	Actual estimated annual use (Mm^3/year)	Actual annual use as a percentage of the consented volume
ARC	207	142	69%
EBOP	402	200	50%
ECan	4,991	2,830	57%
ES	16,182	11,913	74%
EW	641	313	49%
GDC	32	61	192%
GWRC	472	214	45%
HBRC	383	164	43%
HRC	265	79	30%
MDC	238	100	42%
NCC	29	8	26%
NRC	126	57	45%
ORC	2,455	1,063	43%
TDC	116	52	45%
TRC	155	73	47%
WCRC	243	116	48%
Total	**26,936**	**17,386**	**65%**

[6] This figure is higher than the consented allocation. This is because the water meter which measures the municipal consent used in this estimation, measures a combined intake from a dam and a stream for the city water supply. The intake from the dam is consented, but Gisborne District Council staff consider they have an existing use right for the intake from the stream (ie, there is no additional consented volume). Using this meter reading however gives a higher actual water use than the consented volume, but does not mean the consent limit is being breached by the take from the dam.

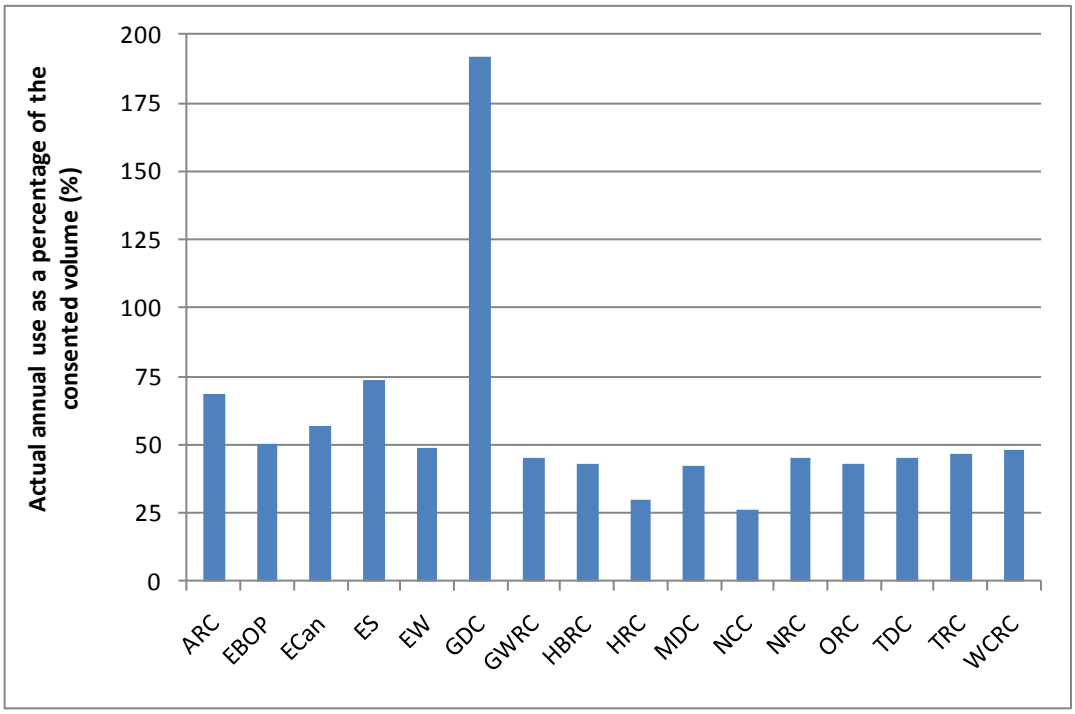

Figure 5-1: Annual water use by regions

5.4 Comparison of Results

It was intended to compare the findings of this study with already completed studies on actual water use, particularly by regional councils. Other than Hawke's Bay Regional Council (HBRC), no detailed studies have been conducted. The Hawke's Bay study has been conducted for the Ngaruroro River catchment and primary water use within the catchment is for irrigation (HBRC, 2008). This study shows that the actual water use varies between 30% and 75% of the consented weekly allocation for different consents. They also found that the larger takes are exercising their consents more fully than the smaller allocations.

The calculated irrigation water use for Hawke's Bay in the current study varies between 22% and 67% for different take rates (Appendix E). These percentages are in reasonable agreement with the values (30% and 75%) presented in the Hawke's Bay study (HBRC, 2008).

6 CONCLUSIONS AND RECOMMENDATIONS

This national scale study required the standardising of consent records as there are significant variations between regions. It was found that there are several differences in interpretation of the data and disparities in data itself between the 2006 and 2010 consent datasets. Therefore, the 2006 database was updated and corrected using available new information in consultation with the councils to be aligned with the 2010 data. However, this update is primarily limited to the common consents between 2006 and 2010 datasets.

There were significant differences in the amount of information recorded for consents between years 1999, 2006 and 2010. Databases show that record completeness is poor for older consents. However, the relative lack of information available during the previous surveys mean that more of the data fields needed calculating/estimating. These estimates have been conducted based on conservative assumptions. Therefore, direct comparison of water allocations and irrigated areas between years needs to be done cautiously.

Important recommendations coming out of this study to improve efficiency and effectiveness of national water management are discussed below. As many of these issues are across regional boundaries, to ensure the solutions are captured they need to be coordinated and driven at the national level.

Study recommendations are:

1. Standardisation of water allocation databases

Many of the problems encountered with the compilation and standardising of consent records into a national dataset during this study were similar to those encountered in the 2006 and 1999 surveys. There is a need to have a national standard for recording water management information to promote a common approach to the recording and description of key information in consent records, and for quality control to ensure records are accurate, complete and provide sufficient information for analysing water source, use and allocation. While councils adopt data storage approaches and systems to suit their specific requirements and resources, there should be commonality so that key elements can be integrated into national datasets.

The key elements that should be promoted are:

- Standardisation of definition of water source and use description;
- Standardisation of allocation units (ℓ/s, m^3/day, m^3/week, Mm^3/year etc); and
- Identification of primary data fields; source, use, take rate, irrigated area etc.

2. Data integrity

Lack of data integrity is an issue in many regional databases. It was found that these issues can hinder the efforts of efficient water allocation and/or unnecessarily locking-up the resource. As an example, it was found that, for some consents the given daily volume is higher than the continuous 24 hour pumping at the instantaneous rate, i.e. daily (m^3/d) > rate (ℓ/s) x 86.4. If the consent holders were to exercise their daily volumetric allocation, they would have to be in breach of their instantaneous rate. Therefore, the higher daily volume indicates less of the resource is available for allocation.

3. National water allocation database and regular updates

This project is intended to get an update of consents, allocations and irrigated areas following two previous surveys in 1999 and 2006. Given the importance of water to the social, economic and environmental well-being of the country, there is a need to develop a process for a more systematic and regular updating of

national and regional water allocation records. This approach would formalise the transfer of key data fields from councils (i.e. source, use, weekly allocation, annual allocation and location) on a regular basis (e.g., annually).

Aqualinc understand that regional authorities, led by Horizons Regional Council, are planning to develop a web portal (Land and Water NZ) to house data from all the regions. This web portal would provide the platform needed to maintain a systematic database and regular updates. However, as described above in item 1, standardisation of water allocation databases throughout the country is important to obtain useable national data from the system.

4. Consented irrigated areas

The discrepancies in estimates of irrigated areas based on consent records and the agricultural census is worthy of further investigation. The lower values for the census probably highlights a weakness in the consent process in that allocations for irrigation are based on an area and take rate at time of the consent application. However, the actual installed area may be considerably lower (as indicated by the census areas), if this is a general trend it means that a considerable proportion of the allocation for irrigation is being under-utilised and in essence being locked-up. Further work evaluating consented irrigated area and actual installed area would verify this issue and the potential to improve the consent process and water allocation efficiency.

5. Actual consented water use

Actual water use assessments shows that the percentage of water use compared to the consented allocation varies between regions from below 30% to nearly 200%. However, water use in most regions is around 50%. The water is generally allocated at a higher reliable rate, particularly for drinking and stock water, therefore average use is expected to be lower than the consented volume.

However, if the actual water use is significantly lower that can have ramifications to water allocation management throughout New Zealand. It essentially means that allocable water resources are being under-utilised, and that with the development of more dynamic monitoring of actual water use, considerably more water could be allocated from some resources, particularly groundwater. It is recommended that the assessment of water use be further investigated, with specific catchment and groundwater zones (aquifers and/or management zones) as case examples to determine levels of water use and implications for resource management.

7 REFERENCES

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Appendix A: Consent database field structure

The regional authorities have been requested to supply following consent information fields for the project:

1. Consent identifier (number)
2. Primary source (e.g. groundwater or surface water)
3. Source type (e.g. river, storage)
4. Source catchment
5. Primary use
6. Use type
7. Description of use
8. Instantaneous rate (ℓ/s)
9. Daily volume (m^3/d)
10. Weekly volume (m^3/week)
11. Summer volume (m^3/season) (the "summer" season months are October to March)
12. Annual volume (m^3/year)
13. Irrigated area (ha)
14. Map reference - Easting (NZ map grid projection)
15. Map reference – Northing (NZ map grid projection)
16. Consent commencement date
17. Consent expiry date
18. Water meter installed (e.g. yes or no)
19. Commencement date of water meter reading
20. Comments, if required

Table A-1 shows the database structure adopted for this project.

Table A-1: Consent database structure adopted for the project

Field Name	Records	Description
Region ID	ARC	Auckland Regional Council
	EBOP	Environment Bay of Plenty
	ECAN	Environment Canterbury
	ES	Environment Southland
	EW	Environment Waikato
	GDC	Gisborne District Council
	GWRC	Greater Wellington Regional Council
	HBRC	Hawke's Bay Regional Council
	HRC	Horizons Regional Council
	MDC	Marlborough District Council
	NCC	Nelson City Council

	NRC	Northland Regional Council
	ORC	Otago Regional Council
	TDC	Tasman District Council
	TRC	Taranaki Regional Council
	WCRC	West Coast Regional Council
Consent identifier (number)	A99999#	Unique identifier as per council records
Primary source	Groundwater	
	Surface water	Includes all surface water takes
Source type	Creek	
	Dam	
	Drain	
	Lake	
	Pond	
	River	
	Spring	
	Stream	
	Water Race	
	Blank	Groundwater or if unspecified for surface water
Source identifier		Surface water source or aquifer description
Source catchment		Surface water catchment
Primary use	Drinking	
	Hydro	
	Industrial	
	Irrigation	
	Stock	
	Not specified	
Use type	Agriculture	
	Aquaculture	
	Aquifer testing	
	Arable	
	Artificial recharge	
	Augment stream flows	
	Commercial	
	Community	

	Construction	
	Cooling	
	Dewatering	
	Domestic	
	Dust Control	
	Energy	
	Fire fighting	
	Flood control	
	Forestry	
	Frost protection	
	Heating	
	Horticulture	
	Landfill	
	Landscaping	
	Machinery operation	
	Maintenance	
	Manufacturing	
	Meat Processing	
	Mining	
	Monitoring	
	Municipal	
	Nursery	
	Orchards	
	Pasture	
	Processing	
	Quarry	
	Recreational	
	Remediation	
	Retail	
	Rural	
	Services	
	Snow making	
	Stockwater	
	Storm water discharge	

	Swimming	
	Viticulture	
	Wash down	
	Waste	
	Water bottling	
	Wetland	
	Not Specified	
Description of use		
Instantaneous rate (ℓ/s)		Listed value or calculated, if not listed
Daily volume (m^3/d)		Listed value or calculated, if not listed
Weekly volume (m^3/week)		Listed value or calculated, if not listed
Summer volume (m^3/season)		Listed value or calculated, if not listed
Annual volume (m^3/year)		Listed value or calculated, if not listed
Irrigated area (ha)		Listed value or calculated, if not listed
Easting (NZMG projection)		NZ map grid projection
Northing (NZMG projection)		NZ map grid projection
Consent commencement date		
Consent expiry date		
Water meter installed	Yes	
	No	
Commencement date of water meter reading		
Notes		

Appendix B: Data availability

Table B-1: Completeness of data field as a percentage of number of consents for the region

Descriptors	Coverage (%)															
	ARC	EBOP	ECan	ES	EW	GDC	GWRC	HBRC	HRC	MDC	NCC	NRC	ORC	TDC	TRC	WCRC
Consent identifier (number)	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Primary source	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Source catchment	99	0	0	0	45	0	0	100	0	0	0	100	0	0	100	71
Primary use	98	100	100	100	100	100	99	99	99	99	100	100	100	98	100	100
Use type	98	100	100	100	100	100	98	100	99	95	78	100	100	99	100	100
Description of use	99	100	100	99	100	100	24	100	43	100	78	0	100	100	100	100
Instantaneous rate (ℓ/s)	1	98	99.9	17	64	100	97	99	52	3	31	54	94	20	83	60
Daily rate (m^3/d)	98	98	99.7	99	97	100	98	0.2	99	95	78	98	50	98	93	69
Weekly rate (m^3/week)	0	1	0	13	0	0	69	89	1	0.2	21	4	24	98	0	0
Summer rate (m^3/season)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Annual rate (m^3/year)	98	2	18	8	44	0	71	3	20	2	0	26	31	0	0	0
Irrigated area (ha) (for irrigation consents only)	0	65	99	4	94	83	0	99	19	90	0	77	50	97	100	91
Easting	100	99	100	100	100	100	99	100	100	100	100	100	99.8	100	100	100
Northing	100	99	100	100	100	100	99	100	100	100	100	100	99.8	100	100	100
Consent commencement date	100	98	100	100	94	100	0	100	99	100	0	95	0	100	100	100
Consent expiry date	99	99	100	100	94	100	97	100	99	99	98	100	100	100	100	100
Water meter installed	100	2	5	0	100	100	52	100	100	100	100	0	0	55	100	0
Commencement date of water meter reading	100	0	5	0	100	100	0	60	0	0	5	0	0	0	0	0

Appendix C: Water allocation - Consent database summaries and comparisons

Consent Numbers

The series of figures and tables below present further details on consent numbers described in Section 3.1.

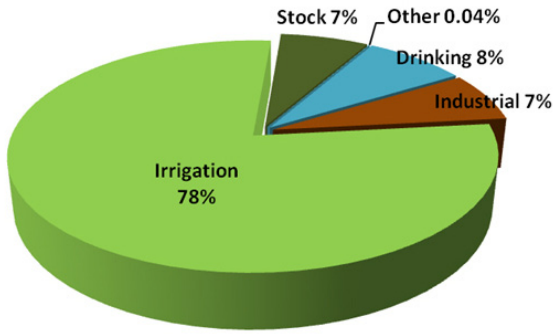


Figure C-1: Groundwater consent distribution by use

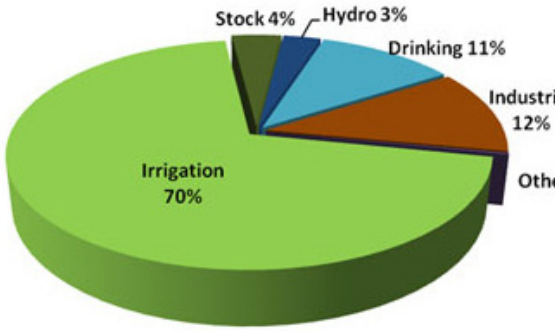


Figure C-2: Surface water consent distribution by use

Table C-1: Consent numbers by region and source

Region	Consent numbers (No.)			
	Groundwater	Surface water	Storage	Total
ARC	1,023	170	88	1,281
EBOP	701	352	7	1,060
ECan	4,994	1,127	65	6,186
ES	816	123	13	952
EW	449	429		878
GDC	84	59	2	145
GWRC	474	204	14	692
HBRC	2,176	255	23	2,454
HRC	386	379		765
MDC	818	590	2	1,410
NCC	9	11	1	21
NRC	249	230	71	550
ORC	554	1,316	109	1,979
TDC	910	311	183	1,404
TRC	87	149	11	247
WCRC	134	320	27	481
Total	**13,864**	**6,025**	**616**	**20,505**

Table C-2: Consent numbers by region and primary use

Region	Consent numbers (No.)						
	Drinking	Hydro	Industrial	Irrigation	Stock	Other	Total
ARC	142		174	894	71		1,281
EBOP	66	7	67	913	6	1	1,060
ECan	376	17	258	5,422	113		6,186
ES	63	6	81	89	712	1	952
EW	239	17	184	337	94	7	878
GDC	10		5	130			145
GWRC	52	3	37	585	10	5	692
HBRC	80	9	97	2,265	3		2,454
HRC	100	24	82	400	158	1	765
MDC	116	2	36	1,256			1,410
NCC	7		4	9	1		21
NRC	148	8	37	346	11		550
ORC	288	50	214	1,418	6	3	1,979
TDC	82	8	48	1,263	3		1,404
TRC	37	11	104	79	16		247
WCRC	80	27	337	37			481
Total	**1,886**	**189**	**1,765**	**15,443**	**1,204**	**18**	**20,505**

Table C-3: Groundwater consent numbers by region and primary use

Region	Drinking	Industrial	Irrigation	Monitoring	Not specified	Stock	Total
ARC	113	146	703			61	1,023
EBOP	43	27	627			4	701
ECan	302	214	4,425			53	4,994
ES	17	43	73			683	816
EW	136	80	157			76	449
GDC	5	5	74				84
GWRC	31	27	408	4	1	3	474
HBRC	62	75	2,037			2	2,176
HRC	51	49	224			62	386
MDC	56	19	743				818
NCC	3	1	5				9
NRC	81	18	144			6	249
ORC	152	90	312				554
TDC	49	31	830				910
TRC	15	53	10			9	87
WCRC	29	95	10				134
Total	**1,145**	**973**	**10,782**	**4**	**1**	**959**	**13,864**

Table C-4: Surface water consent numbers by region and primary use

Region	Drinking	Flood control	Hydro	Industrial	Irrigation	Not specified	Stock	Total
ARC	16			16	131		7	170
EBOP	22		7	36	285		2	352
ECan	68		13	38	948		60	1,127
ES	42	1	5	34	14		27	123
EW	103	7	17	104	180		18	429
GDC	3				56			59
GWRC	21		3	8	165		7	204
HBRC	18		2	22	212		1	255
HRC	49		24	33	176	1	96	379
MDC	60		2	17	511			590
NCC	4			2	4		1	11
NRC	54		8	18	146		4	230
ORC	118	3	33	107	1,049		6	1,316
TDC	33		6	15	254		3	311
TRC	21		6	48	67		7	149
WCRC	46		25	224	25			320
Total	**678**	**11**	**151**	**722**	**4,223**	**1**	**239**	**6,025**

Table C-5: Storage water consent numbers by region and primary use

Region	Drinking	Flood control	Hydro	Industrial	Irrigation	Stock	Total
ARC	13			12	60	3	88
EBOP	1	1		4	1		7
ECan	6		4	6	49		65
ES	4		1	4	2	2	13
EW							
GDC	2						2
GWRC				2	12		14
HBRC			7		16		23
HRC							
MDC					2		2
NCC				1			1
NRC	13			1	56	1	71
ORC	18		17	17	57		109
TDC			2	2	179		183
TRC	1		5	3	2		11
WCRC	5		2	18	2		27
Total	**63**	**1**	**38**	**70**	**438**	**6**	**616**

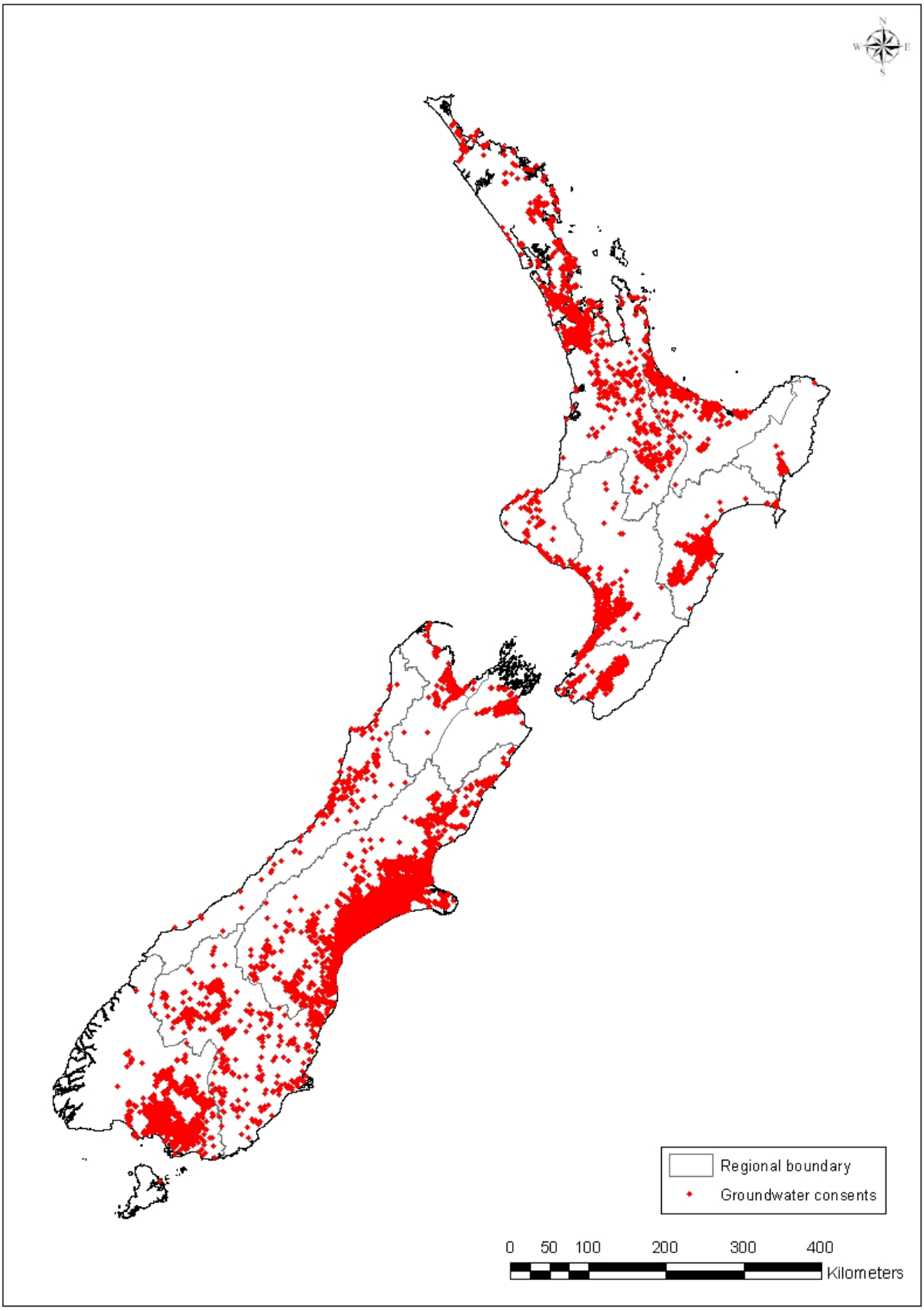


Figure C-3: Distribution of groundwater consents

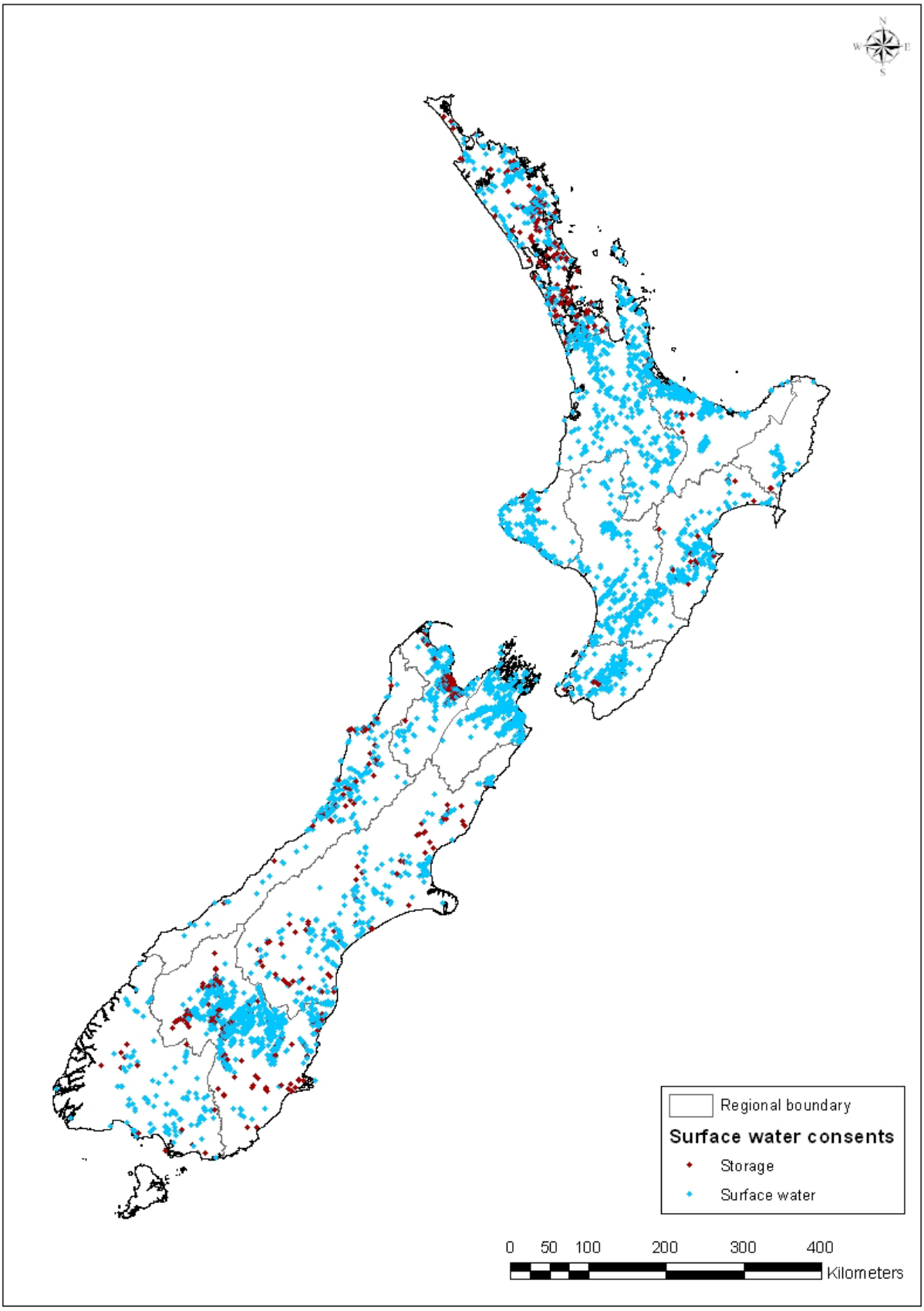


Figure C-4: Distribution of surface water consents

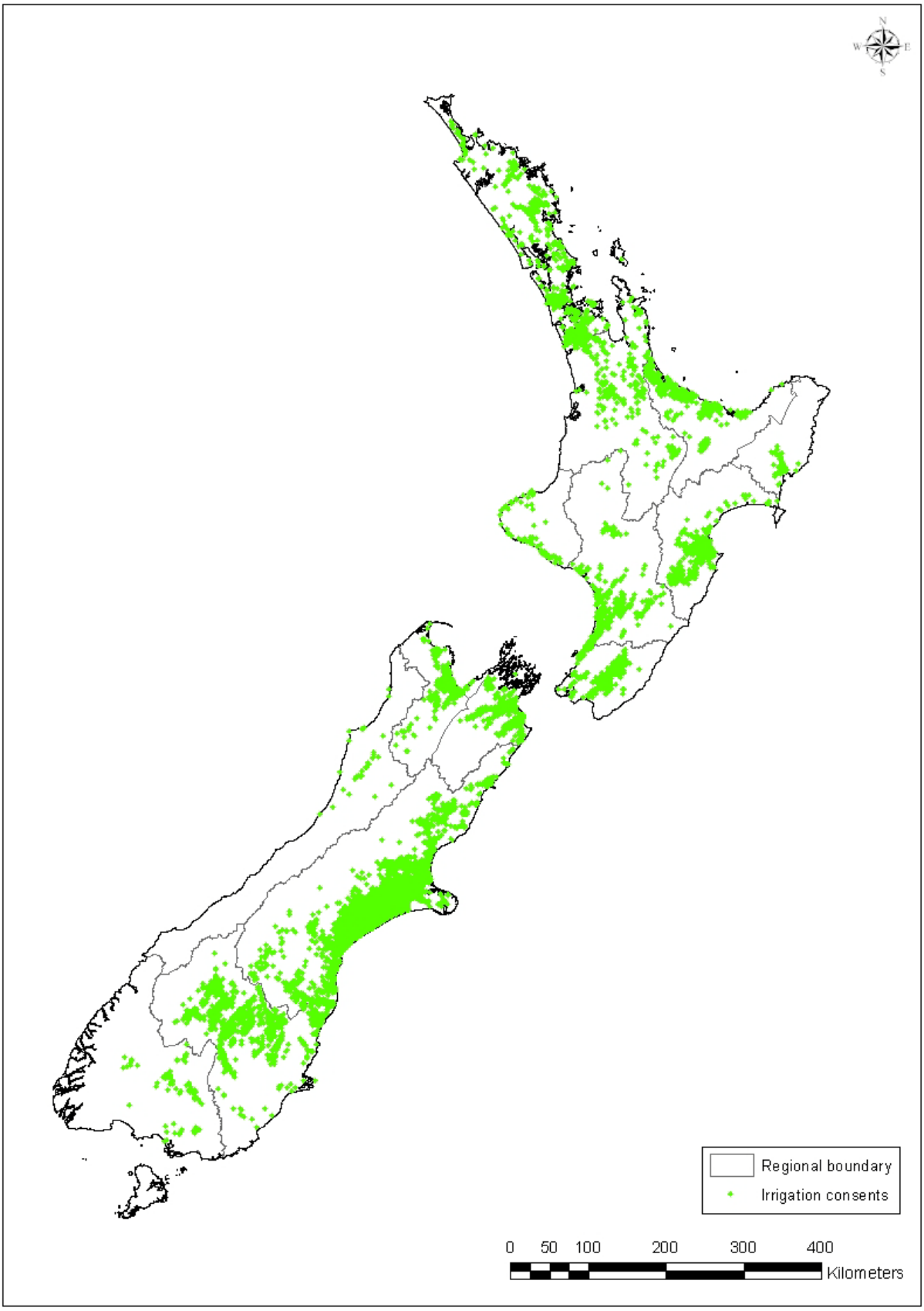


Figure C-5: Distribution of irrigation consents

Water Allocation

The summaries of water allocation are given in Section 3.2. Following figures and tables present additional information on allocated water.

Weekly allocation

Table C-6: Weekly total water allocation (both consumptive and non-consumptive) by region and source

Region	Weekly allocation (Mm^3/week)			
	Groundwater	**Storage**	**Surface water**	**Total**
ARC	1.8	3.3	0.4	5
EBOP	4	0.03	55.6	60
ECan	105.7	485.9	695.4	1,287
ES	3.1	308.5	12.4	324
EW	2.9		204.2	207
GDC	0.4	0.01	1.1	2
GWRC	5.5	0.2	8	14
HBRC	11	126.2	5.7	143
HRC	4.9		1,547.40	1,552
MDC	3.7	0.01	35.6	39
NCC	0.2	0.0001	0.4	1
NRC	0.4	1.7	20.6	23
ORC	5	106.7	98	210
TDC	3.2	0.8	11.9	16
TRC	0.2	21.8	15.1	37
WCRC	0.8	9.2	17.1	27
Total	**153**	**1,064**	**2,729**	**3,946**

Table C-7: Weekly water allocation for consumptive use by region and source

Region	Weekly allocation (Mm^3/week)			
	Groundwater	**Storage**	**Surface water**	**Total**
ARC	1.8	3.3	0.4	5.5
EBOP	4.0	0.03	7.4	11.3
ECan	105.7	2.0	141.5	249.3
ES	3.1	308.48	1.4	313.0
EW	2.9		12.9	15.8
GDC	0.4	0.01	1.1	1.6
GWRC	5.5	0.2	7.3	13.1
HBRC	11.0	0.1	4.4	15.5
HRC	4.9		4.6	9.5
MDC	3.7	0.01	11.1	14.9
NCC	0.2	0.0001	0.4	0.6
NRC	0.4	1.7	2.4	4.5
ORC	5.0	8.6	74.3	87.8
TDC	3.2	0.3	2.2	5.7
TRC	0.2	0.5	3.0	3.8
WCRC	0.8	0.1	4.5	5.4
Total	**153**	**325**	**279**	**757**

Table C-8: Weekly water allocation by region and primary use

Region	Weekly consumptive allocation (Mm^3/week)						Weekly non-consumptive allocation (Mm^3/week)		
	Drinking	Industrial	Irrigation	Stock	Hydro	Total	Hydro	Other	Total
ARC	3.1	1.1	1.3	0.03		5.5			
EBOP	2.5	3.2	5.7	0.01		11.3	48.3		48.3
ECan	8.1	6.3	221.4	13.6		249.3	1,037.80		1,037.80
ES	0.7	0.9	2.4	0.5	308.4	313.0	10.9		10.9
EW	5.0	6.8	3.8	0.1		15.8	126.6	64.7	191.3
GDC	0.3	0.01	1.3			1.6			
GWRC	5.3	0.3	6.5	1.0		13.1	0.7	0.0004	0.7
HBRC	1.3	1.5	12.5	0.1		15.5	127.4		127.4
HRC	2.1	0.9	6.3	0.2		9.5	1,542.80	0.036	1,542.80
MDC	0.5	0.3	14.0	-		14.9	24.5		24.5
NCC	0.6	0.002	0.01	0.0002		0.6			
NRC	1.2	0.3	3.0	0.02		4.5	18.3		18.3
ORC	4.0	21.1	62.7	0.1		87.8	121.4	0.4	121.8
TDC	0.4	0.3	5.0	0.001		5.7	6.9	3.3	10.1
TRC	1.1	1.6	1.1	0.02		3.8	33.3		33.3
WCRC	0.5	3.8	1.1			5.4	21.6		21.6
Total	**37**	**48**	**348**	**16**	**308**	**757**	**3,121**	**68**	**3,189**

Table C-9: Weekly groundwater allocation for consumptive use by region and primary use

Region	Weekly consumptive groundwater allocation (Mm^3/week)				
	Drinking	**Industrial**	**Irrigation**	**Stock**	**Total**
ARC	0.5	0.5	0.8	0.02	1.8
EBOP	0.8	0.2	2.9	0.001	4
ECan	6.7	3.2	95.7	0.12	105.7
ES	0.3	0.2	2.1	0.43	3.1
EW	0.4	1.5	1	0.08	2.9
GDC	0.1	0.01	0.3		0.4
GWRC	2.1	0.1	3.3	0.002	5.5
HBRC	1.2	1.1	8.7	0.01	11
HRC	1.1	0.3	3.4	0.06	4.9
MDC	0.4	0.3	3.0		3.7
NCC	0.2	0.001	0.001		0.2
NRC	0.1	0.2	0.2	0.02	0.4
ORC	0.6	2	2.4		5.0
TDC	0.4	0.2	2.6		3.2
TRC	0.1	0.1	0.04	0.01	0.2
WCRC	0.2	0.5	0.2		0.8
Total	**15**	**11**	**127**	**1**	**153**

Table C-10: Weekly surface water allocation for consumptive use by region and primary use

Region	Weekly consumptive surface water allocation (Mm^3/week)				
	Drinking	**Industrial**	**Irrigation**	**Stock**	**Total**
ARC	0.08	0.04	0.28	0.002	0.4
EBOP	1.68	2.89	2.78	0.004	7.4
ECan	1.36	2.94	123.77	13.46	141.5
ES	0.44	0.68	0.28	0.02	1.4
EW	4.61	5.34	2.89	0.03	12.9
GDC	0.18		0.96		1.1
GWRC	3.26	0.02	2.97	1.03	7.3
HBRC	0.17	0.32	3.74	0.12	4.4
HRC	0.92	0.62	2.94	0.12	4.6
MDC	0.08	0.01	11.03		11.1
NCC	0.37	0.001	0.01	0.0002	0.4
NRC	0.70	0.14	1.52	0.002	2.4
ORC	2.32	18.09	53.78	0.07	74.3
TDC	0.04	0.11	2.03	0.00	2.2
TRC	0.64	1.34	1.02	0.01	3.0
WCRC	0.31	3.29	0.92	-	4.5
Total	**17**	**36**	**211**	**15**	**279**

Table C-11: Weekly water allocation from storage for consumptive use by region and primary use

Region	Weekly consumptive water allocation from storage (Mm^3/week)					
	Drinking	**Hydro**	**Industrial**	**Irrigation**	**Stock**	**Total**
ARC	2.5		0.6	0.2	0.004	3.3
EBOP	0.003		0.02	0.005		0.03
ECan	0.02		0.07	1.9		2.0
ES	0.006	308.5	0.004	0.02	0.002	308.5
GDC	0.01					0.01
GWRC			0.09	0.2		0.25
HBRC				0.1		0.1
MDC				0.01		0.01
NCC						
NRC	0.4		0.002	1.3	0.0004	1.7
ORC	1.0		1.0	6.6		8.6
TDC			0.002	0.3		0.347
TRC	0.4		0.09	0.01		0.5
WCRC	0.04		0.08	0.02		0.14
Total	**4.4**	**308.5**	**1.9**	**10.7**	**0.006**	**325.5**

Table C-12: Weekly irrigation water allocation by region and source

Region	Weekly allocation for irrigation (Mm^3/week)			
	Groundwater	**Storage**	**Surface water**	**Total**
ARC	0.82	0.18	0.28	1.27
EBOP	2.89		2.78	5.68
ECan	95.65	1.93	123.77	221.35
ES	2.13	0.02	0.28	2.44
EW	0.96		2.89	3.84
GDC	0.34		0.96	1.30
GWRC	3.32	0.16	2.97	6.46
HBRC	8.70	0.08	3.74	12.52
HRC	3.38		2.94	6.31
MDC	2.98	0.01	11.03	14.03
NCC	0.001		0.01	0.01
NRC	0.16	1.32	1.52	2.99
ORC	2.37	6.56	53.78	62.71
TDC	2.62	0.35	2.03	4.99
TRC	0.04	0.01	1.02	1.06
WCRC	0.17	0.02	0.92	1.11
Total	**127**	**11**	**211**	**348**

Table C-13: Consented irrigation weekly allocation by crop type

Region	Weekly allocation for irrigation (Mm^3/week)									
	Arable	**Forestry**	**Horticulture**	**Nursery**	**Orchards**	**Pasture**	**Recreational**	**Viticulture**	**Other/ unspecified**	**Total**
ARC			0.80		0.03	0.30	0.15			1.27
EBOP			2.58			2.21	0.07		0.82	5.68
ECan	7.16		13.50			198.99	0.33	0.56	0.82	221.35
ES	0.01		0.16	0.001		2.27	0.001			2.44
EW			0.86			2.76	0.23			3.84
GDC	0.98								0.31	1.30
GWRC	0.17		0.17	0.01		4.61	0.30	0.28	0.92	6.46
HBRC		0.01	5.36	0.04		3.18	0.08	1.82	2.04	12.52
HRC			1.26	0.001		4.76	0.23		0.06	6.31
MDC			1.45	0.002		2.50	0.02	6.32	3.74	14.03
NCC			0.01				0.0002		0.0004	0.01
NRC	0.01		1.62			1.36				2.99
ORC	1.63		8.57	0.002		51.23	0.00002	1.28		62.71
TDC			2.17	0.001		2.65		0.09	0.08	4.99
TRC			0.01	0.003		1.03	0.01			1.06
WCRC	0.65			0.001		0.46				1.11
Total	**11**	**0.01**	**39**	**0.06**	**0.03**	**278**	**1**	**10**	**9**	**348**

Annual allocation

Table C-14: Annual total water allocation (both consumptive and non-consumptive) by region and source

Region	Annual allocation (Mm^3/ year)			
	Groundwater	**Storage**	**Surface water**	**Total**
ARC	46.7	152.0	7.9	207
EBOP	110.9	1.1	2,798.80	2,911
ECan	1,994.90	25,197.10	31,763.10	58,955
ES	76	16,040.30	636.2	16,753
EW	109.2		10,480.40	10,590
GDC	10	0.72	21.2	32
GWRC	194.1	8.3	306.8	509
HBRC	282.8	6,594.50	168.3	7,046
HRC	126.8		80,364.80	80,492
MDC	83.3	0.2	1,431.30	1,515
NCC	9.9	0.01	19.5	29
NRC	17.3	41.6	1,016.20	1,075
ORC	169.9	5,287.80	3,289.10	8,747
TDC	70.2	29.6	543.2	643
TRC	11.5	1,139.80	746.2	1,897
WCRC	34.6	478.7	853.5	1,367
Total	**3,348**	**54,972**	**134,446**	**192,766**

Table C-15: Annual water allocation for consumptive use by region and source

Region	Annual consumptive allocation (Mm^3/year)			
	Groundwater	**Storage**	**Surface water**	**Total**
ARC	46.7	152.0	7.9	207
EBOP	110.9	1.14	289.5	402
ECan	1,994.9	34.2	2,961.4	4,991
ES	76.0	16,040.30	65.6	16,182
EW	109.2		532.2	641
GDC	10.0	0.72	21.2	32
GWRC	194.1	8.3	269.2	472
HBRC	282.8	1.2	98.7	383
HRC	126.8		138.7	265
MDC	83.3	0.2	154.9	238
NCC	9.9	0.01	19.5	29
NRC	17.3	41.6	67.2	126
ORC	169.9	215.4	2,069.5	2,455
TDC	70.2	5.6	39.9	116
TRC	11.5	26.9	116.4	155
WCRC	34.6	6.8	201.8	243
Total	**3,348**	**16,534**	**7,054**	**26,936**

Table C-16: Annual water allocation by region and primary use

Region	Annual consumptive allocation (Mm^3/year)						Annual non-consumptive allocation (Mm^3/year)		
	Drinking	**Industrial**	**Irrigation**	**Stock**	**Hydro**	**Total**	**Hydro**	**Other**	**Total**
ARC	145.0	44.8	15.7	1		206.5			
EBOP	130.2	163.9	107.2	0.3		401.6	2,509.3		2,509.3
ECan	384.5	318	3,583.40	704.6		4,990.5	53,964.5		53,964.5
ES	36.1	47.8	35.2	23.4	16,039.3	16,181.9	570.7		570.7
EW	248.5	328.1	59.8	5		641.4	6,583.5	3,364.8	9,948.3
GDC	14.6	0.3	17.1			31.9			
GWRC	273.3	11.8	133.1	53.4		471.6	37.6	0.02	37.7
HBRC	82.1	117.4	176.6	6.6		382.7	6,662.8		6,662.8
HRC	107.2	48	99.5	9.5		265.2	80,226.2	1.3	80,227.5
MDC	24.6	18	195.9			238.4	1,276.3		1,276.3
NCC	29	0.1	0.1	0.01		29.3			
NRC	57.6	15.6	51.7	1.1		126.1	949.0		949.0
ORC	194.9	1,057.70	1,198.40	3.8		2,454.9	6,273.0	18.9	6,291.9
TDC	20.8	15.8	79	0.04		115.7	357.4	169.8	527.3
TRC	59.8	81.1	12.9	1		154.8	1,742.7		1,742.7
WCRC	26.4	199	17.8			243.2	1,123.6		1,123.6
Total	**1,835**	**2,467**	**5,784**	**810**	**16,039.3**	**26,936**	**162,277**	**3,555**	**165,831**

Table C-17: Annual groundwater allocation for consumptive use by region and primary use

Region	Annual consumptive groundwater allocation (Mm^3/year)				
	Drinking	**Industrial**	**Irrigation**	**Stock**	**Total**
ARC	21.6	15	9.3	0.77	46.7
EBOP	42.9	12.9	55	0.07	110.9
ECan	313.2	161.8	1,515.20	4.61	1,994.90
ES	12.7	12.4	28.8	22.08	76
EW	16.8	74.8	14.1	3.54	109.2
GDC	4.2	0.3	5.4		10.0
GWRC	103.6	6.9	83.5	0.07	194.1
HBRC	72.7	84.8	124.7	0.54	282.8
HRC	59.4	15.9	48.4	3.16	126.8
MDC	20.6	17.4	45.3		83.3
NCC	9.8	0.076	0.013		9.9
NRC	4.9	8.3	3	1.02	17.3
ORC	26.3	95.1	48.5		169.9
TDC	18.6	10.2	41.4		70.2
TRC	4.3	6.4	0.43	0.32	11.5
WCRC	8.1	23.7	2.8		34.6
Total	**740**	**546**	**2,026**	**36**	**3,348**

Table C-18: Annual surface water allocation for consumptive use by region and primary use

Region	Annual consumptive surface water allocation (Mm^3/year)				
	Drinking	**Industrial**	**Irrigation**	**Stock**	**Total**
ARC	2.37	1.57	3.88	0.07	7.9
EBOP	87.15	150.06	52.09	0.2	289.5
ECan	70.36	152.89	2,038.22	699.98	2,961.40
ES	23.09	35.24	5.99	1.26	65.6
EW	231.68	253.31	45.74	1.45	532.2
GDC	9.61		11.62		21.2
GWRC	169.71	0.44	45.69	53.32	269.2
HBRC	9.38	32.62	50.67	6.03	98.7
HRC	47.79	32.1	52.14	6.35	138.4
MDC	4.04	0.59	150.31		154.9
NCC	19.27	0.04	0.14	0.01	19.5
NRC	33.88	7.19	25.99	0.1	67.2
ORC	118.73	909.84	1,037.12	3.83	2,069.50
TDC	2.18	5.55	32.12	0.04	39.9
TRC	33.36	70.01	12.36	0.7	116.4
WCRC	15.99	171.07	14.74		201.8
Total	**879**	**1,823**	**3,579**	**773**	**7,053**

Table C-19: Annual water allocation from storage for consumptive use by region and primary use

Region	Annual consumptive water allocation from storage (Mm^3/year)					
	Drinking	**Hydro**	**Industrial**	**Irrigation**	**Stock**	**Storage Total**
ARC	121.0		28.3	2.5	0.2	152.0
EBOP	0.1		0.9	0.1		1.1
ECan	1.0		3.3	29.9		34.2
ES	0.3	16,039.3	0.2	0.4	0.1	16,040.3
GDC	0.7					0.7
GWRC			4.4	3.9		8.3
HBRC				1.2		1.2
MDC				0.2		0.2
NCC						
NRC	18.7		0.1	22.8	0.02	41.6
ORC	49.9		52.8	112.8		215.4
TDC			0.1	5.5		5.6
TRC	22.1		4.6	0.1		26.9
WCRC	2.3		4.3	0.3		6.8
Total	**216.2**	**16,039.3**	**99.0**	**179.7**	**0.3**	**16,534.5**

Table C-20: Annual irrigation water allocation by region and source

Region	Annual irrigation allocation (Mm^3/year)			
	Groundwater	**Storage**	**Surface water**	**Total**
ARC	9.3	2.5	3.9	15.7
EBOP	55	0.1	52.1	107.2
ECan	1,515.20	29.9	2,038.20	3,583.40
ES	28.8	0.4	6	35.2
EW	14.1		45.7	59.8
GDC	5.4		11.6	17.1
GWRC	83.5	3.9	45.7	133.1
HBRC	124.7	1.2	50.7	176.6
HRC	48.4		52.1	100.5
MDC	45.3	0.2	150.3	195.9
NCC	0.01		0.1	0.1
NRC	3	22.8	26	51.7
ORC	48.5	112.8	1,037.1	1,198.4
TDC	41.4	5.5	32.1	79
TRC	0.4	0.1	12.4	12.9
WCRC	2.8	0.3	14.7	17.8
Total	**2,026**	**180**	**3,579**	**5,785**

Table C-21: Consented irrigation annual allocation by crop type

Region	Annual irrigation allocation (Mm^3/year)									
	Arable	**Forestry**	**Horticulture**	**Nursery**	**Orchards**	**Pasture**	**Recreational**	**Viticulture**	**Other/ unspecified**	**Total**
ARC			8.7		0.5	4.0	2.6			15.7
EBOP			52.7			49.1	1.5		3.9	107.2
ECan	111		215.8			3,217.6	5.5	7.6	25.8	3,583.4
ES	0.1		1.3	0.04		33.8	0.03			35.2
EW			11.9			44.1	3.8			59.8
GDC	15.7								1.3	17.1
GWRC	3.1		5.8	0.5		106.9	3.7	6.2	6.9	133.1
HBRC		0.1	85.9	0.7		50.8	1.2	29.2	8.8	176.6
HRC			26.5	0.02		69.3	3.6		1.0	100.5
MDC			23.2	0.03		41.4	0.3	90.5	40.4	195.9
NCC			0.1				0.003		0.01	0.1
NRC	0.1		28.9			22.7				51.7
ORC	22.7		146.2	0.03		1,004.4	0.0003	25.1		1,198.4
TDC			34.6	0.02		42.4		1.4	0.5	79.0
TRC			0.1	0.04		12.5	0.2			12.9
WCRC	10.4			0.01		7.4				17.8
Total	**163**	**0.1**	**642**	**1**	**0.5**	**4,707**	**22**	**160**	**89**	**5,785**

Summer allocation

Table C-22: Summer total water allocation (both consumptive and non-consumptive) by region and source

Region	Summer allocation (Mm^3/ season)			
	Groundwater	Storage	Surface water	Total
ARC	27.2	77.2	5.7	110
EBOP	81.2	0.6	1,423.70	1,505
ECan	1,738.20	12,613.30	16,870.10	31,221
ES	52.4	8,020.30	321.1	8,394
EW	61.1		5,260.60	5,322
GDC	7.7	0.36	15.1	23
GWRC	131	6.1	173.8	311
HBRC	198.2	3,297.80	106.1	3,602
HRC	83.7		40,204.80	40,289
MDC	63.3	0.2	769	833
NCC	4.9	0.004	9.8	15
NRC	10	32.1	520.3	562
ORC	106.1	2,699.60	2,045.90	4,852
TDC	55.6	17.6	287.5	361
TRC	6	569.9	379.3	955
WCRC	18.7	239.5	434.1	692
Total	**2,645**	**27,575**	**68,827**	**99,047**

Table C-23: Summer total water allocation for consumptive use by region and source

Region	Summer allocation (Mm^3/ season)			
	Groundwater	Storage	Surface water	Total
ARC	27.2	77.2	5.7	110
EBOP	81.2	0.64	169.1	251
ECan	1,738.2	31.8	2,469.2	4,239
ES	52.4	8,020.35	35.8	8,109
EW	61.1		286.4	348
GDC	7.7	0.36	15.1	23
GWRC	131.0	6.1	155.0	292
HBRC	198.2	1.2	71.3	271
HRC	83.7		91.7	175
MDC	63.3	0.2	130.8	194
NCC	4.9	0.004	9.8	15
NRC	10.0	32.1	45.8	88
ORC	106.1	163.5	1,436.1	1,706
TDC	55.6	5.6	35.9	97
TRC	6.0	13.5	64.4	84
WCRC	18.7	3.6	108.3	131
Total	**2,645**	**8,356**	**5,130**	**16,132**

Table C-24: Summer water allocation by region and primary use

Region	Summer consumptive allocation (Mm^3/season)						Summer non-consumptive allocation (Mm^3/season)		
	Drinking	Industrial	Irrigation	Stock	Hydro	Total	Hydro	Other	Total
ARC	72.5	22.4	14.7	0.5		110.1			
EBOP	65.1	82	103.7	0.1		250.9	1,254.6		1,254.6
ECan	192.3	159	3,535.70	352.3		4,239.2	26,982.3		26,982.3
ES	18.1	23.9	35.2	11.7	8,019.6	8,108.5	285.3		285.3
EW	124.2	164.1	56.7	2.5		347.5	3,291.8	1,682.4	4,974.1
GDC	7.3	0.2	15.7			23.2			
GWRC	136.7	5.9	122.8	26.7		292.1	18.8	0.01	18.8
HBRC	41.1	58.7	167.6	3.3		270.7	3,331.4		3,331.4
HRC	53.6	24	92.9	4.8		175.3	40,113.1	0.1	40,113.2
MDC	12.3	9	173.1			194.4	638.2		638.2
NCC	14.5	0.1	0.1	0.004		14.7			
NRC	28.8	7.8	50.8	0.6		87.9	474.5		474.5
ORC	97.5	528.8	1,077.50	1.9		1,705.6	3,136.5	9.4	3,145.9
TDC	10.4	7.9	78.7	0.02		97.1	178.7	84.9	263.6
TRC	29.9	40.5	12.9	0.5		83.8	871.3		871.3
WCRC	13.2	99.5	17.8			130.5	561.8		561.8
Total	**917**	**1,234**	**5,556**	**405**	**8,019.6**	**16,132**	**81,138**	**1,777**	**82,915**

Table C-25: Summer groundwater allocation for consumptive use by region and primary use

Region	Summer consumptive groundwater allocation (Mm^3/season)				
	Drinking	**Industrial**	**Irrigation**	**Stock**	**Total**
ARC	10.8	7.5	8.5	0.39	27.2
EBOP	21.5	6.5	53.2	0.04	81.2
ECan	156.6	80.9	1,498.30	2.31	1,738.20
ES	6.4	6.2	28.8	11.04	52.4
EW	8.4	37.4	13.5	1.77	61.1
GDC	2.1	0.2	5.4		7.7
GWRC	51.8	3.4	75.7	0.04	131
HBRC	36.4	42.4	119.1	0.27	198.2
HRC	29.7	8	44.5	1.58	83.7
MDC	10.3	8.7	44.4		63.3
NCC	4.9	0.038	0.013		4.9
NRC	2.5	4.2	2.9	0.51	10
ORC	13.1	47.5	45.5		106.1
TDC	9.3	5.1	41.2		55.6
TRC	2.2	3.2	0.43	0.16	6
WCRC	4.1	11.9	2.8		18.7
Total	**370**	**273**	**1,984**	**18**	**2,645**

Table C-26: Summer surface water allocation for consumptive use by region and primary use

Region	Summer consumptive surface water allocation (Mm^3/season)				
	Drinking	**Industrial**	**Irrigation**	**Stock**	**Total**
ARC	1.19	0.79	3.71	0.04	5.7
EBOP	43.58	75.03	50.36	0.1	169.1
ECan	35.18	76.44	2,007.61	349.99	2,469.20
ES	11.54	17.62	5.99	0.63	35.8
EW	115.84	126.67	43.19	0.73	286.4
GDC	4.8		10.28		15.1
GWRC	84.86	0.22	43.27	26.66	155
HBRC	4.69	16.31	47.3	3.02	71.3
HRC	23.89	16.05	48.44	3.17	91.6
MDC	2.01	0.29	128.55		130.8
NCC	9.64	0.02	0.14	0.004	9.8
NRC	16.94	3.6	25.19	0.05	45.8
ORC	59.36	454.9	919.9	1.92	1,436.10
TDC	1.09	2.77	32	0.02	35.9
TRC	16.68	35.01	12.36	0.35	64.4
WCRC	8	85.53	14.74		108.3
Total	**439**	**911**	**3,393**	**387**	**5,130**

Table C-27: Summer water allocation from storage for consumptive use by region and primary use

Region ID	Summer consumptive water allocation from storage (Mm^3/season)					
	Drinking	**Hydro**	**Industrial**	**Irrigation**	**Stock**	**Total**
ARC	60.5		14.1	2.5	0.1	77.2
EBOP	0.1		0.5	0.1		0.6
ECan	0.5		1.6	29.7		31.8
ES	0.2	8,019.6	0.1	0.4	0.04	8,020.3
GDC	0.4			-		0.4
GWRC			2.2	3.9		6.1
HBRC				1.2		1.2
MDC				0.2		0.2
NCC				-		-
NRC	9.4		0.1	22.7	0.01	32.1
ORC	25.0		26.4	112.1		163.5
TDC			0.05	5.5		5.6
TRC	11.1		2.3	0.1		13.5
WCRC	1.1		2.1	0.3		3.6
Total	**108.1**	**8,019.6**	**49.5**	**178.7**	**0.1**	**8,356.1**

Table C-28: Summer irrigation water allocation by region and source

Region	Summer irrigation allocation (Mm^3/season)			
	Groundwater	**Storage**	**Surface water**	**Total**
ARC	8.5	2.5	3.7	14.7
EBOP	53.2	0.1	50.4	103.7
ECan	1,498.30	29.7	2,007.60	3,535.70
ES	28.8	0.4	6	35.2
EW	13.5		43.2	56.7
GDC	5.4		10.3	15.7
GWRC	75.7	3.9	43.3	122.8
HBRC	119.1	1.2	47.3	167.6
HRC	44.5		48.4	92.9
MDC	44.4	0.2	128.5	173.1
NCC	0.01		0.1	0.1
NRC	2.9	22.7	25.2	50.8
ORC	45.5	112.1	919.9	1,077.50
TDC	41.2	5.5	32	78.7
TRC	0.4	0.1	12.4	12.9
WCRC	2.8	0.3	14.7	17.8
Total	**1,984**	**179**	**3,393**	**5,556**

Table C-29: Consented irrigation summer allocation by crop type

Region	Summer irrigation allocation (Mm^3/season)									
	Arable	**Forestry**	**Horticulture**	**Nursery**	**Orchards**	**Pasture**	**Recreational**	**Viticulture**	**Other/ unspecified**	**Total**
ARC			7.9		0.5	3.9	2.4			14.7
EBOP			52.1			48.9	1.5		1.1	103.7
ECan	110.5		215.8			3,180.6	5.3	7.5	15.9	3,535.70
ES	0.1		1.3	0.02		33.8	0.03			35.2
EW			10.9			42.2	3.7			56.7
GDC	15.7									15.7
GWRC	3		4.7	0.3		101.1	3.5	5.7	4.5	122.8
HBRC		0.1	85.7	0.7		50.8	1.2	29.2	-	167.6
HRC			22.3	0.02		66.0	3.6		1.0	92.9
MDC			23.2	0.03		40.9	0.3	90.1	18.7	173.1
NCC			0.1				0.003		0.01	0.1
NRC	0.1		28.2			22.5				50.8
ORC	21.2		145.4	0.03		887.5	0.0003	23.3		1,077.50
TDC			34.6	0.02		42.4	-	1.4	0.3	78.7
TRC			0.1	0.04		12.5	0.2			12.9
WCRC	10.4			0.01		7.4				17.8
Total	**161**	**0.1**	**632**	**1**	**0.5**	**4,541**	**22**	**157**	**41**	**5,556**

Table C-30: Consented irrigated areas by region

Region	Irrigated area (ha)									
	Arable	**Forestry**	**Horticulture**	**Nursery**	**Orchards**	**Pasture**	**Recreational**	**Viticulture**	**Other**	**Total**
ARC			4,176.3		212.6	1,155.6	719.1			6,263.7
EBOP			8,664.2			7,140.4	189.3		227.9	16,221.7
ECan	31,357.7		53,088.8			590,202.5	1,037.9	2,347.5	2,093.2	680,127.7
ES	22.7		454.0	2.9		9,186.5	153			9,819.0
EW			4,011.1			9,703.0	369.3			14,083.4
GDC	3,924.8									3,924.8
GWRC	549		569.8	10.1		13,085.8	796	948.7	671.8	16,631.2
HBRC		21.2	24,786.5	143.3		15,119.3	291.2	6,795.1		47,156.6
HRC			4,178.9	2.8		15,610.9	646.9		451.6	20,891.1
MDC			6,083.5	4		10,346.9	99.7	34,076.3	4,380.4	54,990.8
NCC			26.8				0.4		0.9	28.2
NRC	30		4,825.2			3,915.6			5,622.9	14,393.7
ORC	4,961.9		26,153.9	5.3		132,713.1	6.0	3,898.3		167,738.6
TDC			7,219.4	4.8		8,846.1		563.9	86.9	16,720.9
TRC			48.4	14.7		3,271.1	33			3,367.2
WCRC	1,976.2			0.1		2,167.2				4,143.4
Total	**42,822.3**	**21.2**	**144,286.8**	**187.9**	**212.6**	**822,464.0**	**4,341.8**	**48,629.9**	**13,535.6**	**1,076,502**

Appendix D: Regional summaries of water allocation

Auckland Regional Council

Consents (number)

Primary use	Groundwater	Surface water	Total
Drinking	113	29	142
Industrial	146	28	174
Irrigation	703	191	894
Stock	61	10	71
Total	**1,023**	**258**	**1,281**

Weekly Allocation (m^3/week)

Primary use	Groundwater	Surface water	Total
Drinking	510,733	2,594,619	3,105,352
Industrial	469,430	607,144	1,076,573
Irrigation	818,489	455,694	1,274,183
Stock	23,940	6,713	30,653
Total	**1,822,592**	**3,664,169**	**5.486,761**

Summer Allocation (m^3/season)

Primary use	Groundwater	Surface water	Total
Drinking	10,821,928	61,677,933	72,499,860
Industrial	7,489,040	14,928,258	22,417,297
Irrigation	8,526,919	6,167,524	14,694,443
Stock	387,089	118,410	505,499
Total	**27,224,974**	**82,892,124**	**110,117,098**

Note: Summer season is for the period October – March.

Annual Allocation (m^3/year)

Primary use	Groundwater	Surface water	Total
Drinking	21,643,855	123,355,865	144,999,720
Industrial	14,978,079	29,856,515	44,834,594
Irrigation	9,285,760	6,412,409	15,698,169
Stock	774,177	236,820	1,010,997
Total	**46,681,871**	**159,861,609**	**206,543,480**

Consented Irrigated Area (ha)

Use type	Groundwater	Surface water	Total
Horticulture	3,175	1,002	4,176
Pasture	266	890	1,156
Recreational	564	155	719
Orchards	129	84	213
Total (ha)	**4,134**	**2,130**	**6,264**

Environment Bay of Plenty

Consents (number)

Primary use	Groundwater	Surface water	Total
Drinking	43	23	66
Flood control		1	1
Hydro		7	7
Industrial	27	40	67
Irrigation	627	286	913
Stock	4	2	6
Total	**701**	**359**	**1,060**

Weekly Allocation (m^3/week)

Primary use	Groundwater	Surface water	Total
Drinking	825,432	1,678,723	2,504,156
Hydro		48,254,846	48,254,846
Industrial	248,747	2,903,916	3,152,663
Irrigation	2,888,229	2,788,965	5,677,193
Stock	1,416	3,842	5,258
Total	**3,963,824**	**55,630,291**	**59,594,115**

Seasonal Allocation (m^3/season)

Primary use	Groundwater	Surface water	Total
Drinking	21,453,832	43,646,803	65,100,635
Hydro		1,254,625,994	1,254,625,994
Industrial	6,467,416	75,495,748	81,963,163
Irrigation	53,204,198	50,459,542	103,663,740
Stock	36,819	99,882	136,700
Total	**81,162,264**	**1,424,327,968**	**1,505,490,232**

Note: Summer season is the period October – March.

Annual Allocation (m^3/year)

Primary use	Groundwater	Surface water	Total
Drinking	42,876,664	87,293,606	130,170,270
Hydro		2,509,251,987	2,509,251,987
Industrial	12,934,831	150,956,621	163,891,452
Irrigation	55,031,844	52,187,737	107,219,581
Stock	73,637	199,763	273,400
Total	**110,916,976**	**2,799,889,715**	**2,910,806,690**

Consented Irrigated Area (ha)

Use type	Groundwater	Surface water	Total
Horticulture	5,718	3,160	8,878
Pasture	2,028	5,112	7,140
Recreational	106	83	189
Unspecified	13		13
Total (ha)	**7,866**	**8,356**	**16,222**

Environment Canterbury

Consents (number)

Primary use	Groundwater	Surface water	Total
Drinking	302	74	376
Hydro		17	17
Industrial	214	44	258
Irrigation	4,425	997	5,422
Stock	53	60	113
Total	**4,994**	**1,192**	**6,186**

Weekly Allocation (m^3/week)

Primary use	Groundwater	Surface water	Total
Drinking	6,736,807	1,378,810	8,115,617
Hydro		1,037,779,358	1,037,779,358
Industrial	3,237,346	3,013,020	6,250,366
Irrigation	95,650,665	125,704,015	221,354,679
Stock	119,693	13,462,498	13,582,191
Total	**105,744,511**	**1,181,337,700**	**1,287,082,211**

Seasonal Allocation (m^3/season)

Primary use	Groundwater	Surface water	Total
Drinking	156,596,889	35,674,309	192,271,197
Hydro		26,982,263,308	26,982,263,308
Industrial	80,915,858	78,088,619	159,004,478
Irrigation	1,498,335,166	2,037,316,993	3,535,652,160
Stock	2,306,539	349,987,744	352,294,283
Total	**1,738,154,452**	**29,483,330,973**	**31,221,485,426**

Note: Summer season is the period October – March.

Annual Allocation (m^3/year)

Primary use	Groundwater	Surface water	Total
Drinking	313,193,777	71,348,618	384,542,395
Hydro		53,964,526,616	53,964,526,616
Industrial	161,831,717	156,177,238	318,008,955
Irrigation	1,515,227,532	2,068,170,414	3,583,397,946
Stock	4,613,078	699,975,488	704,588,566
Total	**1,994,866,104**	**56,960,198,374**	**58,955,064,478**

Consented Irrigated Area (ha)

Use type	Groundwater	Surface water	Total
Arable	22,133	9,225	31,358
Horticulture	9,195	43,893	53,089
Pasture	339,459	250,743	590,202
Recreational	925	113	1,038
Unspecified	1,172	921	2,093
Viticulture	1,577	770	2,348
Total (ha)	**374,461**	**305,667**	**680,128**

Environment Southland

Consents (number)

Primary use	Groundwater	Surface water	Total
Drinking	17	46	63
Flood Control		1	1
Hydro		6	6
Industrial	43	38	81
Irrigation	73	16	89
Stock	683	29	712
Total	**816**	**136**	**952**

Weekly Allocation (m^3/week)

Primary use	Groundwater	Surface water	Total
Drinking	266,409	449,053	715,462
Hydro		319,392,009	319,392,009
Industrial	248,113	679,687	927,800
Irrigation	2,133,493	305,542	2,439,034
Stock	428,191	25,832	454,022
Total	**3,076,205**	**320,852,122**	**323,928,327**

Seasonal Allocation (m^3/season)

Primary use	Groundwater	Surface water	Total
Drinking	6,356,438	11,707,455	18,063,893
Hydro		8,304,973,946	8,304,973,946
Industrial	6,181,420	17,720,403	23,901,823
Irrigation	28,809,365	6,379,950	35,189,315
Stock	11,039,389	673,472	11,712,862
Total	**52,386,613**	**8,341,455,227**	**8,393,841,839**

Note: Summer season is the period October – March.

Annual Allocation (m^3/year)

Primary use	Groundwater	Surface water	Total
Drinking	12,712,876	23,414,911	36,127,787
Hydro		16,609,947,892	16,609,947,892
Industrial	12,362,840	35,440,807	47,803,647
Irrigation	28,841,138	6,379,950	35,221,088
Stock	22,078,779	1,346,945	23,425,724
Total	**75,995,633**	**16,676,530,504**	**16,752,526,136**

Consented Irrigated Area (ha)

Use type	Groundwater	Surface water	Total
Arable		23	23
Horticulture	439	15	454
Nursery	1	2	3
Pasture	8,331	855	9,186
Recreational	153		153
Total (ha)	**8,924**	**895**	**9,819**

Environment Waikato

Consents (number)

Primary use	Groundwater	Surface water	Total
Drinking	136	103	239
Flood Control		7	7
Hydro		17	17
Industrial	80	104	184
Irrigation	157	180	337
Stock	76	18	94
Total	**449**	**429**	**878**

Weekly Allocation (m^3/week)

Primary use	Groundwater	Surface water	Total
Drinking	371,826	4,605,028	4,976,854
Flood Control		40,514,768	40,514,768
Hydro		126,633,556	126,633,556
Industrial	1,498,340	29,533,539	31,031,879
Irrigation	957,131	2,887,631	3,844,762
Stock	83,185	28,247	111,432
Total	**2,910,482**	**204,202,769**	**207,113,251**

Note: Some Industrial consents are non-consumptive

Seasonal Allocation (m^3/season)

Primary use	Groundwater	Surface water	Total
Drinking	8,400,148	115,840,241	124,240,389
Flood Control		1,053,383,968	1,053,383,968
Hydro		3,291,753,176	3,291,753,176
Industrial	37,395,938	755,660,969	793,056,907
Irrigation	13,547,990	43,190,014	56,738,004
Stock	1,771,332	725,949	2,497,281
Total	**61,115,408**	**5,260,554,316**	**5,321,669,724**

Note: Summer season is the period October – March.

Annual Allocation (m^3/year)

Primary use	Groundwater	Surface water	Total
Drinking	16,800,296	231,680,481	248,480,777
Flood Control		2,106,767,936	2,106,767,936
Hydro		6,583,506,352	6,583,506,352
Industrial	74,785,876	1,511,297,938	1,586,083,814
Irrigation	14,067,793	45,742,586	59,810,379
Stock	3,542,664	1,451,898	4,994,562
Grand Total	**109,196,629**	**10,480,447,191**	**10,589,643,820**

Note: Some Industrial consents are non-consumptive

Consented Irrigated Area (ha)

Use type	Groundwater	Surface water	Total
Horticulture	2,225	1,786	4,011
Pasture	1,638	8,065	9,703
Recreational	120	249	369
Total (ha)	**3,983**	**10,101**	**14,083**

Gisborne District Council

Consents (number)

Primary use	Groundwater	Surface water	Total
Drinking	5	5	10
Industrial	5		5
Irrigation	74	56	130
Total	**84**	**61**	**145**

Weekly Allocation (m^3/week)

Primary use	Groundwater	Surface water	Total
Drinking	81,508	198,587	280,095
Industrial	6,052		6,052
Irrigation	340,102	955,150	1,295,252
Total	**427,662**	**1,153,737**	**1,581,399**

Seasonal Allocation (m^3/season)

Primary use	Groundwater	Surface water	Total
Drinking	2,119,208	5,164,254	7,283,462
Industrial	157,339		157,339
Irrigation	5,441,632	10,275,440	15,717,072
Total	**7,718,179**	**15,439,694**	**23,157,873**

Note: Summer season is the period October – March.

Annual Allocation (m^3/year)

Primary use	Groundwater	Surface water	Total
Drinking	4,238,416	10,328,508	14,566,924
Industrial	314,678		314,678
Irrigation	5,441,632	11,616,590	17,058,222
Total	**9,994,726**	**21,945,098**	**31,939,824**

Consented Irrigated Area (ha)

Use type	Groundwater	Surface water	Total
Arable	1,179	2,746	3,925
Total (ha)	**1,179**	**2,746**	**3,925**

Greater Wellington Regional Council

Consents (number)

Primary use	Groundwater	Surface water	Total
Drinking	31	21	52
Hydro		3	3
Industrial	27	10	37
Irrigation	408	177	585
Monitoring	4		4
Other	1		1
Stock	3	7	10
Total	**474**	**218**	**692**

Weekly Allocation (m^3/week)

Primary use	Groundwater	Surface water	Total
Drinking	2,055,116	3,263,679	5,318,795
Hydro		721,829	721,829
Industrial	143,468	108,765	252,232
Irrigation	3,321,433	3,134,707	6,456,140
Monitoring	420		420
Stock	2,278	1,025,388	1,027,666
Total	**5,522,714**	**8,254,367**	**13,777,081**

Seasonal Allocation (m^3/season)

Primary use	Groundwater	Surface water	Total
Drinking	51,816,608	84,855,654	136,672,262
Hydro		18,818,957	18,818,957
Industrial	3,442,077	2,446,490	5,888,567
Irrigation	75,693,628	47,133,938	122,827,566
Monitoring	10,920		10,920
Stock	35,628	26,660,088	26,695,716
Total	**130,998,861**	**179,915,126**	**310,913,987**

Note: Summer season is the period October – March.

Annual Allocation (m^3/year)

Primary use	Groundwater	Surface water	Total
Drinking	103,633,216	169,711,308	273,344,524
Hydro		37,637,914	37,637,914
industrial	6,884,154	4,892,980	11,777,134
Irrigation	83,538,469	49,553,692	133,092,161
Monitoring	21,840		21,840
Stock	71,257	53,320,176	53,391,433
Total	**194,148,935**	**315,116,069**	**509,265,004**

Consented Irrigated Area (ha)

Use type	Groundwater	Surface water	Total
Arable	374	174	549
Horticulture	489	81	570
Not Specified		672	672
Nursery	10		10
Pasture	7,896	5,190	13,086
Recreational	220	576	796
Viticulture	823	125	949
Total (ha)	**9,813**	**6,818**	**16,631**

Hawke's Bay Regional Council

Consents (number)

Primary use	Groundwater	Surface water	Total
Drinking	62	18	80
Hydro		9	9
Industrial	75	22	97
Irrigation	2,037	228	2,265
Stock	2	1	3
Total	**2,176**	**278**	**2,454**

Note: Data presented here may under represent the surface water takes and over represent the groundwater takes as some wells that are categorised under groundwater are likely to be hydraulically connected to surface water bodies.

Weekly Allocation (m^3/week)

Primary use	Groundwater	Surface water	Total
Drinking	1,176,054	173,001	1,349,055
Hydro		127,431,360	127,431,360
Industrial	1,145,877	324,221	1,470,098
Irrigation	8,700,921	3,820,052	12,520,973
Stock	10,488	116,000	126,488
Total	**11,033,339**	**131,864,634**	**142,897,973**

Seasonal Allocation (m^3/season)

Primary use	Groundwater	Surface water	Total
Drinking	36,373,315	4,690,457	41,063,772
Hydro		3,331,419,840	3,331,419,840
Industrial	42,411,692	16,311,961	58,723,653
Irrigation	119,136,021	48,496,033	167,632,053
Stock	269,550	3,016,000	3,285,550
Total	**198,190,577**	**3,403,934,291**	**3,602,124,869**

Note: Summer season is the period October – March.

Annual Allocation (m^3/year)

Primary use	Groundwater	Surface water	Total
Drinking	72,746,630	9,380,914	82,127,544
Hydro		6,662,839,680	6,662,839,680
Industrial	84,823,384	32,623,922	117,447,306
Irrigation	124,720,324	51,874,446	176,594,770
Stock	539,100	6,032,000	6,571,100
Total	**282,829,438**	**6,762,750,962**	**7,045,580,400**

Consented Irrigated Area (ha)

Use type	Groundwater	Surface water	Total
Forestry	1	20	21
Horticulture	20,919	3,868	24,787
Nursery	143		143
Pasture	7,644	7,476	15,119
Recreational	290	1	291
Viticulture	6,129	666	6,795
Total (ha)	**35,126**	**12,030**	**47,157**

Horizons Regional Council

Consents (number)

Primary use	Groundwater	Surface water	Total
Drinking	51	49	100
Hydro		24	24
Industrial	49	33	82
Irrigation	224	176	400
Not Specified		1	1
Stock	62	96	158
Total	**386**	**379**	**765**

Weekly Allocation (m^3/week)

Primary use	Groundwater	Surface water	Total
Drinking	1,142,288	918,946	2,061,234
Hydro		1,542,811,407	1,542,811,407
Industrial	309,824	617,218	927,042
Irrigation	3,378,571	2,935,290	6,313,861
Not Specified		4,900	4,900
Stock	61,184	122,555	183,738
Total	**4,891,866**	**1,547,410,316**	**1,552,302,182**

Seasonal Allocation (m^3/season)

Primary use	Groundwater	Surface water	Total
Drinking	29,701,343	23,892,596	53,593,939
Hydro		40,113,096,587	40,113,096,587
Industrial	7,955,140	16,047,668	24,002,808
Irrigation	44,499,480	48,444,321	92,943,802
Not Specified		127,400	127,400
Stock	1,579,421	3,186,669	4,766,089
Total	**83,735,383**	**40,204,795,241**	**40,288,530,625**

Note: Summer season is the period October – March.

Annual Allocation (m^3/year)

Primary use	Groundwater	Surface water	Total
Drinking	59,402,686	47,785,192	107,187,878
Hydro		80,226,193,174	80,226,193,174
Industrial	15,910,279	32,095,336	48,005,615
Irrigation	48,358,501	52,143,987	100,502,488
Not Specified		254,800	254,800
Stock	3,158,841	6,373,337	9,532,178
Total	**126,830,307**	**80,364,845,827**	**80,491,676,134**

Note: HRC uses 55 m^3/s flow rate to assess the hydro takes rather than the consented maximum daily volumes that has been determined to capture flood flows.

Consented Irrigated Area (ha)

Use type	Groundwater	Surface water	Total
Horticulture	1,822	2,357	4,179
Not Specified	3	449	452
Nursery		3	3
Pasture	8,587	7,024	15,611
Recreational	637	10	647
Total (ha)	**11,049**	**9,842**	**20,891**

Marlborough District Council

Consents (number)

Primary use	Groundwater	Surface water	Total
Drinking	56	60	116
Hydro		2	2
Industrial	19	17	36
Irrigation	743	513	1,256
Total	**818**	**592**	**1,410**

Weekly Allocation (m^3/week)

Primary use	Groundwater	Surface water	Total
Drinking	397,772	77,634	475,406
Hydro		24,494,400	24,494,400
Industrial	337,074	11,892	348,966
Irrigation	2,984,596	11,047,091	14,031,687
Total	**3,719,442**	**35,631,017**	**39,350,459**

Seasonal Allocation (m^3/season)

Primary use	Groundwater	Surface water	Total
Drinking	10,283,855	2,012,459	12,296,314
Hydro		638,172,000	638,172,000
Industrial	8,682,198	285,139	8,967,337
Irrigation	44,371,594	128,774,208	173,145,802
Total	**63,337,647**	**769,243,806**	**832,581,453**

Note: Summer season is the period October – March.

Annual Allocation (m^3/year)

Primary use	Groundwater	Surface water	Total
Drinking	20,567,711	4,037,237	24,604,948
Hydro		1,276,344,000	1,276,344,000
Industrial	17,369,116	590,438	17,959,554
Irrigation	45,324,280	150,537,065	195,861,345
Total	**83,261,107**	**1,431,508,740**	**1,514,769,847**

Consented Irrigated Area (ha)

Use type	Groundwater	Surface water	Total
Horticulture	1,153	4,931	6,083
Nursery	3	1	4
Pasture	1,174	9,173	10,347
Recreation	81	19	100
Unspecified	294	4,087	4,381
Viticulture	13,879	20,197	34,076
Total (ha)	**16,583**	**38,407**	**54,991**

Nelson City Council

Consents (number)

Primary use	Groundwater	Surface water	Total
Drinking	3	4	7
Industrial	1	3	4
Irrigation	5	4	9
Stock		1	1
Total	**9**	**12**	**21**

Weekly Allocation (m^3/week)

Primary use	Groundwater	Surface water	Total
Drinking	187,740	370,587	558,327
Industrial	1,462	980	2,442
Irrigation	826	8,533	9,359
Stock		159	159
Total	**190,028**	**380,259**	**570,287**

Seasonal Allocation (m^3/season)

Primary use	Groundwater	Surface water	Total
Drinking	4,881,240	9,635,262	14,516,502
Industrial	38,002	25,480	63,482
Irrigation	13,216	136,528	149,744
Stock		4,131	4,131
Total	**4,932,458**	**9,801,401**	**14,733,859**

Note: Summer season is the period October – March.

Annual Allocation (m^3/year)

Primary use	Groundwater	Surface water	Total
Drinking	9,762,480	19,270,524	29,033,004
Industrial	76,003	50,960	126,963
Irrigation	13,216	136,528	149,744
Stock		8,263	8,263
Total	**9,851,699**	**19,466,275**	**29,317,974**

Consented Irrigated Area (ha)

Use type	Groundwater	Surface water	Total
Horticulture	1.4	25.4	26.8
Recreational		0.4	0.4
Unspecified	0.9		0.9
Total (ha)	**2.3**	**25.8**	**28.2**

Northland Regional Council

Consents (number)

Primary use	Groundwater	Surface water	Total
Drinking	81	67	148
Hydro		8	8
Industrial	18	19	37
Irrigation	144	202	346
Stock	6	5	11
Total	**249**	**301**	**550**

Weekly Allocation (m^3/week)

Primary use	Groundwater	Surface water	Total
Drinking	106,041	1,071,259	1,177,300
Hydro		18,272,415	18,272,415
Industrial	157,103	140,875	297,978
Irrigation	156,086	2,837,324	2,993,410
Stock	19,936	2,310	22,246
Total	**439,166**	**22,324,183**	**22,763,349**

Seasonal Allocation (m^3/season)

Primary use	Groundwater	Surface water	Total
Drinking	2,467,756	26,308,444	28,776,199
Hydro		474,508,850	474,508,850
Industrial	4,167,327	3,655,490	7,822,817
Irrigation	2,875,463	47,875,675	50,751,138
Stock	510,071	60,085	570,156
Total	**10,020,617**	**552,408,544**	**562,429,160**

Note: Summer season is the period October – March.

Annual Allocation (m^3/year)

Primary use	Ground	Surface	Grand Total
Drinking	4,935,512	52,616,887	57,552,399
Hydro		949,017,700	949,017,700
Industrial	8,334,654	7,310,980	15,645,634
Irrigation	2,989,145	48,745,892	51,735,037
Stock	1,020,142	120,170	1,140,312
Total	**17,279,453**	**1,057,811,629**	**1,075,091,082**

Consented Irrigated Area (ha)

Use type	Groundwater	Surface water	Total
Arable		30	30
Horticulture	914	3,911	4,825
Pasture	74	9,364	9,439
Other		100	100
Total (ha)	**988**	**13,405**	**14,394**

Otago Regional Council

Consents (number)

Primary use	Groundwater	Surface water	Total
Drinking	152	136	288
Flood control		3	3
Hydro		50	50
Industrial	90	124	214
Irrigation	312	1,106	1,418
Stock		6	6
Total	**554**	**1,425**	**1,979**

Weekly Allocation (m^3/week)

Primary use	Groundwater	Surface water	Total
Drinking	623,400	3,349,011	3,972,410
Flood control		362,880	362,880
Hydro		121,412,983	121,412,983
Industrial	1,959,967	19,105,741	21,065,708
Irrigation	2,369,362	60,337,230	62,706,592
Stock		73,496	73,496
Total	**4,952,729**	**204,641,340**	**209,594,069**

Seasonal Allocation (m^3/season)

Primary use	Groundwater	Surface water	Total
Drinking	13,145,598	84,323,767	97,469,365
Flood control		9,434,880	9,434,880
Hydro		3,136,503,921	3,136,503,921
Industrial	47,495,373	481,279,542	528,774,915
Irrigation	45,458,613	1,032,018,626	1,077,477,238
Stock		1,916,166	1,916,166
Total	**106,099,583**	**4,745,476,902**	**4,851,576,485**

Note: Summer season is the period October – March.

Annual Allocation (m^3/year)

Primary use	Groundwater	Surface water	Total
Drinking	26,291,195	168,647,534	194,938,729
Flood control		18,869,760	18,869,760
Hydro		6,273,007,842	6,273,007,842
Industrial	95,063,562	962,600,038	1,057,663,600
Irrigation	48,539,717	1,149,894,295	1,198,434,012
Stock		3,832,332	3,832,332
Total	**169,894,475**	**8,576,851,801**	**8,746,746,276**

Consented Irrigated Area (ha)

Use type	Groundwater	Surface water	Total
Arable	263	4,699	4,962
Horticulture	1,630	24,524	26,154
Nursery	5	1	5
Pasture	4,244	128,469	132,713
Recreational		6	6
Viticulture	742	3,156	3,898
Total (ha)	**6,884**	**160,854**	**167,739**

Tasman District Council

Consents (number)

Primary use	Groundwater	Surface water	Total
Drinking	49	33	82
Hydro		8	8
Industrial	31	17	48
Irrigation	830	433	1,263
Stock		3	3
Total	**910**	**494**	**1,404**

Weekly Allocation (m^3/week)

Primary use	Groundwater	Surface water	Total
Drinking	358,561	41,863	400,424
Hydro		6,873,926	6,873,926
Industrial	195,709	3,374,416	3,570,124
Irrigation	2,617,341	2,374,460	4,991,801
Stock		749	749
Total	**3,171,611**	**12,665,413**	**15,837,024**

Note: Some Industrial consents are non-consumptive

Seasonal Allocation (m^3/season)

Primary use	Groundwater	Surface water	Total
Drinking	9,322,586	1,088,438	10,411,024
Hydro		178,722,076	178,722,076
Industrial	5,088,427	87,734,806	92,823,233
Irrigation	41,207,797	37,525,272	78,733,069
Stock		19,474	19,474
Total	**55,618,810**	**305,090,066**	**360,708,875**

Note: Summer season is the period October – March.

Annual Allocation (m^3/year)

Primary use	Groundwater	Surface water	Total
Drinking	18,645,172	2,176,876	20,822,048
Hydro		357,444,152	357,444,152
Industrial	10,176,854	175,469,611	185,646,465
Irrigation	41,375,213	37,641,792	79,017,005
Stock		38,948	38,948
Total	**70,197,239**	**572,771,379**	**642,968,618**

Note: Some Industrial consents are non-consumptive

Consented Irrigated Area (ha)

Use type	Groundwater	Surface water	Total
Horticulture	4,147	3,072	7,219
Nursery	5		5
Pasture	4,028	4,818	8,846
Unspecified	6	81	87
Viticulture	173	391	564
Total	**8,359**	**8,362**	**16,721**

Taranaki Regional Council

Consents (number)

Primary use	Groundwater	Surface water	Total
Drinking	15	22	37
Hydro		11	11
Industrial	53	51	104
Irrigation	10	69	79
Stock	9	7	16
Total	**87**	**160**	**247**

Weekly Allocation (m^3/week)

Primary use	Groundwater	Surface water	Total
Drinking	82,699	1,061,308	1,144,007
Hydro		33,329,890	33,329,890
Industrial	122,640	1,427,745	1,550,385
Irrigation	35,578	1,025,799	1,061,377
Stock	6,191	13,296	19,487
Total	**247,108**	**36,858,038**	**37,105,146**

Seasonal Allocation (m^3/season)

Primary use	Groundwater	Surface water	Total
Drinking	2,161,999	27,745,618	29,907,617
Hydro		871,338,542	871,338,542
Industrial	3,206,160	37,325,346	40,531,506
Irrigation	432,021	12,456,130	12,888,151
Stock	161,845	347,590	509,435
Total	**5,962,025**	**949,213,226**	**955,175,251**

Note: Summer season is the period October – March.

Annual Allocation (m^3/year)

Primary use	Groundwater	Surface water	Total
Drinking	4,323,997	55,491,236	59,815,234
Hydro		1,742,677,085	1,742,677,085
Industrial	6,412,320	74,650,692	81,063,012
Irrigation	432,021	12,456,130	12,888,151
Stock	323,690	695,180	1,018,871
Total	**11,492,029**	**1,885,970,323**	**1,897,462,352**

Consented Irrigated Area (ha)

Use type	Groundwater	Surface water	Total
Horticultural	6	42	48
Nursery		15	15
Pasture	238	3,034	3,271
Recreational		33	33
Total (ha)	**244**	**3,123**	**3,367**

West Coast Regional Council

Consents (number)

Primary use	Groundwater	Surface water	Total
Drinking	29	51	80
Hydro		27	27
Industrial	95	242	337
Irrigation	10	27	37
Total	**134**	**347**	**481**

Weekly Allocation (m^3/week)

Primary use	Groundwater	Surface water	Total
Drinking	156,284	350,912	507,196
Hydro		21,606,963	21,606,963
Industrial	455,851	3,371,701	3,827,552
Irrigation	174,301	939,800	1,114,101
Total	**786,436**	**26,269,376**	**27,055,812**

Seasonal Allocation (m^3/season)

Primary use	Groundwater	Surface water	Total
Drinking	4,063,388	9,123,710	13,187,098
Hydro		561,781,038	561,781,038
Industrial	11,852,117	87,664,224	99,516,341
Irrigation	2,788,822	15,036,797	17,825,620
Total	**18,704,327**	**673,605,770**	**692,310,097**

Note: Summer season is the period October – March.

Annual Allocation (m^3/year)

Primary use	Groundwater	Surface water	Total
Drinking	8,126,775	18,247,421	26,374,196
Hydro		1,123,562,076	1,123,562,076
Industrial	23,704,233	175,328,448	199,032,681
Irrigation	2,788,822	15,036,797	17,825,620
Total	**34,619,831**	**1,332,174,742**	**1,366,794,573**

Consented Irrigated Area (ha)

Use type	Groundwater	Surface water	Total
Arable		1,976	1,976
Nursery		0.1	0.1
Pasture	672	1,495	2,167
Total	**672**	**3,471**	**4,143**

Appendix E: Actual water use

This appendix presents the supporting information used in the estimation of actual water use, and regional summary results.

Table E-1: ECan guidelines for daily stock water requirements (Source: ECan (2007))

Stock type		Litres/head/day
Dairy cattle	- in lactation	70
	- dry	45
Beef cattle		45
Calves		25
Horses	- working	55
	- grazing	35
Breeding ewes		3
Sows		25
Pigs		11
Poultry	- per 100 birds	30
Turkey	- per 100 birds	55

Table E-2: Lengths of water use record used for the assessment by use type and region

Region	Use	Length (years)	Region	Use	Length (years)
ARC	Drinking	8	GW	Industrial	3
ARC	Drinking	17	GW	Irrigation	4
ARC	Industrial	9	GW	Irrigation	6
ARC	Irrigation	9	HBRC	Drinking	11
ARC	Irrigation	9	HBRC	Drinking	4
ARC	Stock	13	HBRC	Frost Protection	6
EBOP	Drinking	11	HBRC	Industrial	1
EBOP	Drinking	11	HBRC	Industrial	2
EBOP	Drinking	3	HBRC	Irrigation	3
EBOP	Drinking	8	HBRC	Irrigation	5
EBOP	Industrial	5	HBRC	Irrigation	7
EBOP	Irrigation	5	HBRC	Irrigation	15
EBOP	Irrigation	3	HBRC	Irrigation	11
EBOP	Irrigation	2	HBRC	Irrigation	3
EBOP	Irrigation	3	HBRC	Irrigation	1
EBOP	Irrigation	5	HBRC	Irrigation	11
EBOP	Irrigation	4	HBRC	Irrigation	5
EBOP	Irrigation	2	HBRC	Irrigation	3
EBOP	Irrigation	5	HBRC	Irrigation	2
EBOP	Irrigation	2	HBRC	Irrigation	6
EBOP	Irrigation	7	HBRC	Stock	4
EBOP	Irrigation	2	HBRC	Stock	12
Ecan	Drinking	16	HRC	Drinking	2
Ecan	Industrial	12	HRC	Drinking	0.58
Ecan	Industrial	17	HRC	Industrial	1
Ecan	Industrial	10	HRC	Irrigation	3
Ecan	Irrigation	3	HRC	Irrigation	3
Ecan	Irrigation	5	HRC	Irrigation	3
Ecan	Irrigation	1	HRC	Irrigation	1

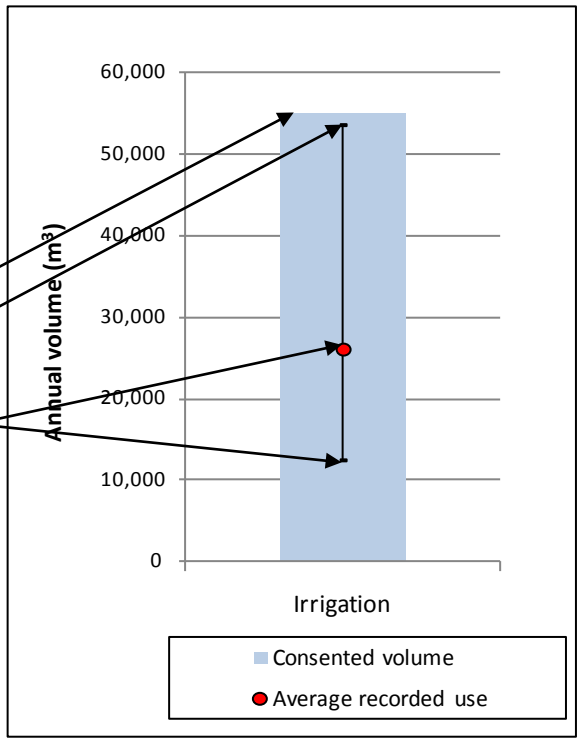
Region	Use	Length (years)	Region	Use	Length (years)
Ecan	Irrigation	1	HRC	Irrigation	0.33
Ecan	Irrigation	1	HRC	Irrigation	5
Ecan	Irrigation	3	HRC	Stock	0.42
Ecan	Irrigation	1	MDC	Drinking	14
Ecan	Irrigation	4	MDC	Irrigation	8
Ecan	Irrigation	4	MDC	Irrigation	2
Ecan	Irrigation	2	MDC	Irrigation	1
Ecan	Irrigation	2	MDC	Irrigation	1
Ecan	Irrigation	4	MDC	Irrigation	4
Ecan	Irrigation	5	MDC	Irrigation	6
Ecan	Irrigation	5	MDC	Irrigation	1
Ecan	Irrigation	4	MDC	Irrigation	2
Ecan	Irrigation	3	MDC	Irrigation	3
Ecan	Irrigation	1	MDC	Irrigation	2
Ecan	Irrigation	1	MDC	Irrigation	1
Ecan	Irrigation	4	MDC	Irrigation	5
Ecan	Irrigation	4	NRC	Drinking	23
Ecan	Irrigation	1	NRC	Drinking	1
Ecan	Irrigation	1	NRC	Drinking	1
Ecan	Irrigation	3	NRC	Irrigation	0.17
Ecan	Irrigation	2	NRC	Irrigation	0.08
Ecan	Irrigation	3	NRC	Irrigation	0.42
Ecan	Irrigation	4	ORC	Drinking	1
Ecan	Irrigation	3	ORC	Drinking	4
Ecan	Irrigation	1	ORC	Drinking	1
Ecan	Irrigation	3	ORC	Industrial	4
Ecan	Irrigation	1	ORC	Industrial	1
Ecan	Irrigation	3	ORC	Irrigation	2
Ecan	Irrigation	2	ORC	Irrigation	3
Ecan	Irrigation	1	ORC	Irrigation	5
Ecan	Irrigation	3	ORC	Irrigation	1
ES	Drinking	8	ORC	Irrigation	1
ES	Drinking	29	ORC	Irrigation	5
ES	Industrial	9	ORC	Irrigation	5
ES	Industrial	11	ORC	Irrigation	1
ES	Industrial	11	ORC	Irrigation	1
ES	Irrigation	5	ORC	Irrigation	3
ES	Irrigation	5	TDC	Drinking	5
ES	Irrigation	7	TDC	Drinking	5
ES	Irrigation	3	TDC	Industrial	5
ES	Hydro	12	TDC	Irrigation	2
EW	Drinking	3	TDC	Irrigation	5
EW	Drinking	5	TDC	Irrigation	5
EW	Industrial	8	TRC	Drinking	11
EW	Industrial	1	TRC	Drinking	9
EW	Irrigation	7	TRC	Drinking	8
EW	Irrigation	8	TRC	Industrial	10
EW	Irrigation	4	TRC	Industrial	9
EW	Irrigation	7	TRC	Industrial	6
EW	Irrigation	4	TRC	Irrigation	4
EW	Irrigation	6	TRC	Irrigation	4
EW	Irrigation	5	TRC	Irrigation	5
EW	Irrigation	5	WCRC	Drinking	5
EW	Irrigation	4	WCRC	Drinking	5
EW	Stock	0.42	WCRC	Drinking	5
GDC	Drinking	2	WCRC	Drinking	1

Region	Use	Length (years)	Region	Use	Length (years)
GDC	Irrigation	4	WCRC	Drinking	3
GDC	Irrigation	3	WCRC	Drinking	5
GDC	Irrigation	4	WCRC	Drinking	2
GDC	Irrigation	1	GW	Industrial	3

Regional Water Use Summaries

The regional summary results of the actual water use analysis are presented in this appendix. Figures show the consented against the actual water use for each sample consent (presented in Table E 2) analysed. This analysis is based on the annual water use. The average annual water use with the range (i.e. minimum and maximum annual water use) is given for each consent. Following example illustrates how the analysis was carried out. This example also demonstrates the variation in annual water use over the low (possibly during wet years) and high (possibly dry years) consumption.

Year	Annual water use (m^3/year)
2003	38,583
2004	12,500
2005	12,910
2006	26,100
2007	17,840
2008	20,575
2009	53,620
Consented (m^3/year)	55,000
Max actual use (m^3/year)	53,620
Min actual use (m^3 year)	12,500
Average actual use (m^3/year)	26,018
Consented rate (ℓ/s)	57
Percentage average use	**47% (26,018 / 55,000)**



The following tables list the consented and estimated actual water use volumes along with the actual use percentage for different primary use types and take rate categories.

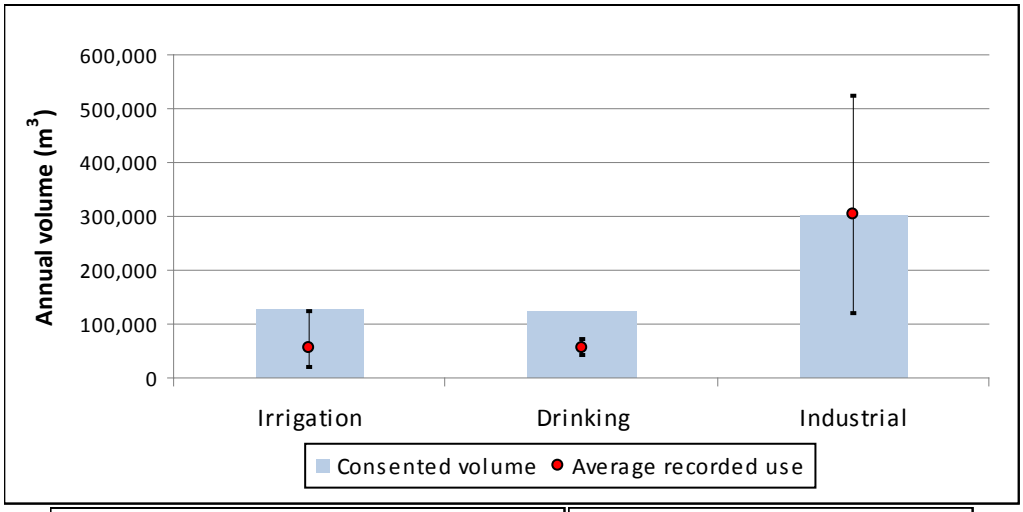
Note that multiple figures were prepared for each council to improve the readability as the variation of the consented volumes is too high to include the range in one figure.

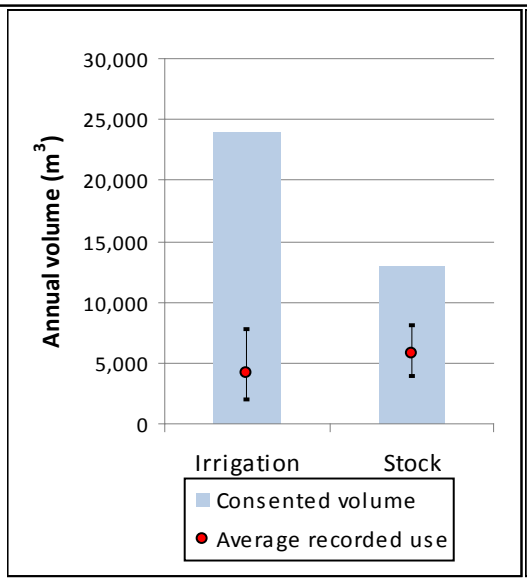
Auckland Regional Council

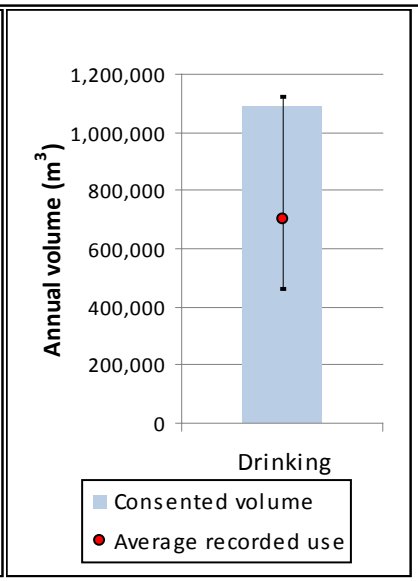
Actual Water Use

Primary use	Flow rate (ℓ/s)	Sum of consented annual rate (m^3/year)	Sum of actual annual water use (m^3/year)	Actual use as a percentage of consented volume
Drinking	<40	5,738,352	2,517,973	44%
	>40	139,261,368	89,470,692	64%
Drinking Total		144,999,720	91,988,665	63%
Industrial		44,834,594	44,959,704	100%
Irrigation		15,698,169	4,695,362	30%
Stock		1,010,997	455,170	45%
Grand Total		**206,543,480**	**142,098,901**	**69%**

Note: This Summary excludes non-consumptive takes





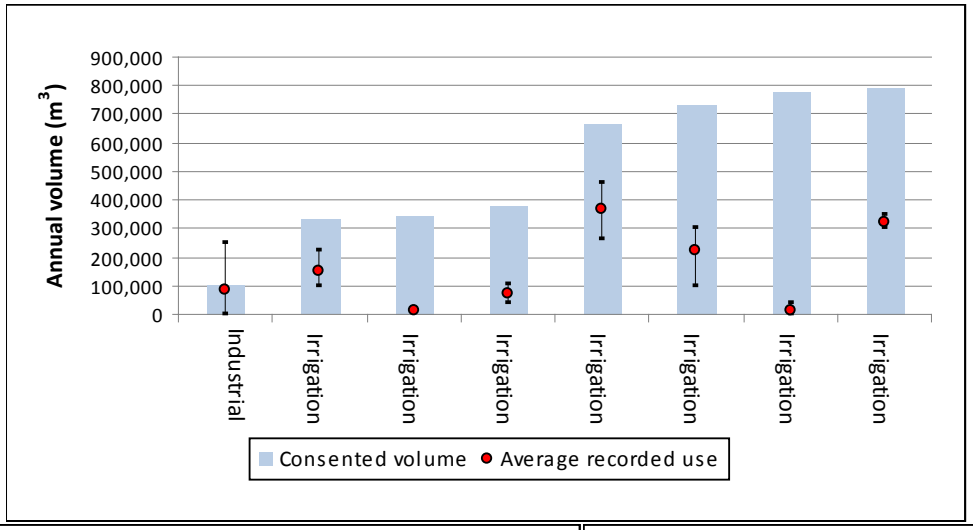


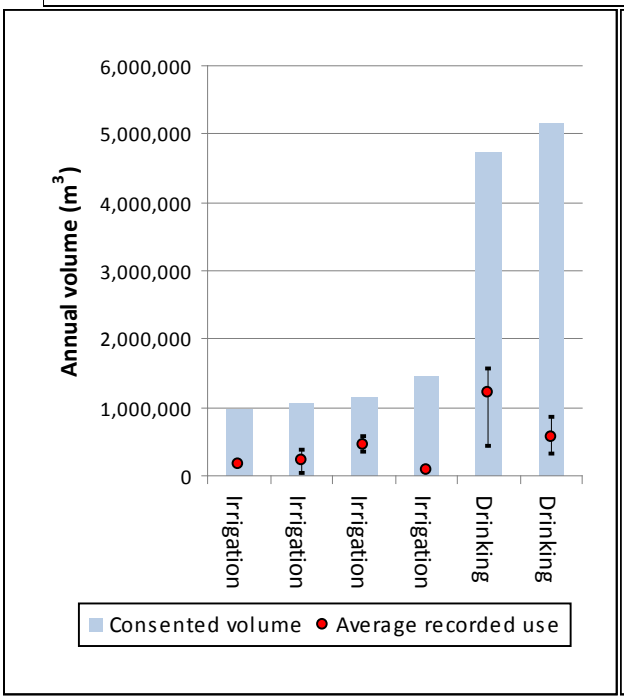
Environment Bay of Plenty

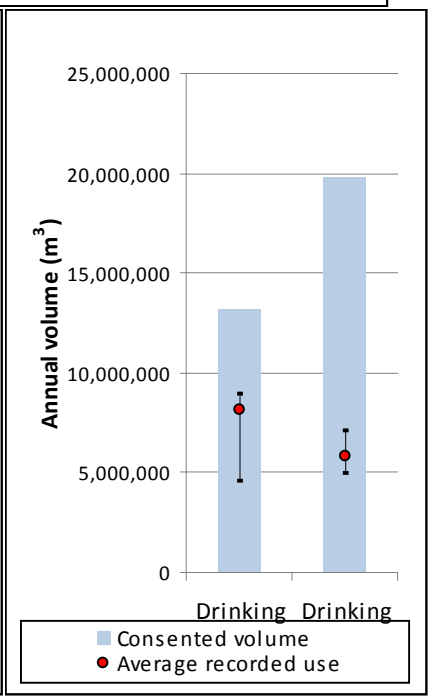
Actual Water Use

Primary use	Flow rate (ℓ/s)	Sum of consented annual rate (m^3/year)	Sum of actual annual water use (m^3/year)	Actual use as a percentage of consented volume
Drinking		130,170,270	41,246,251	32%
Industrial		163,891,452	138,236,651	84%
Irrigation	<100	85,151,075	14,475,683	17%
	100 - 150	17,862,067	4,134,111	23%
	>150	4,206,440	1,984,438	47%
Irrigation Total		107,219,582	20,594,232	19%
Stock		273,400	163,123	60%
Grand Total		**401,554,704**	**200,240,257**	**50%**

Note: This Summary excludes non-consumptive takes
Stock percentage is based on national estimate







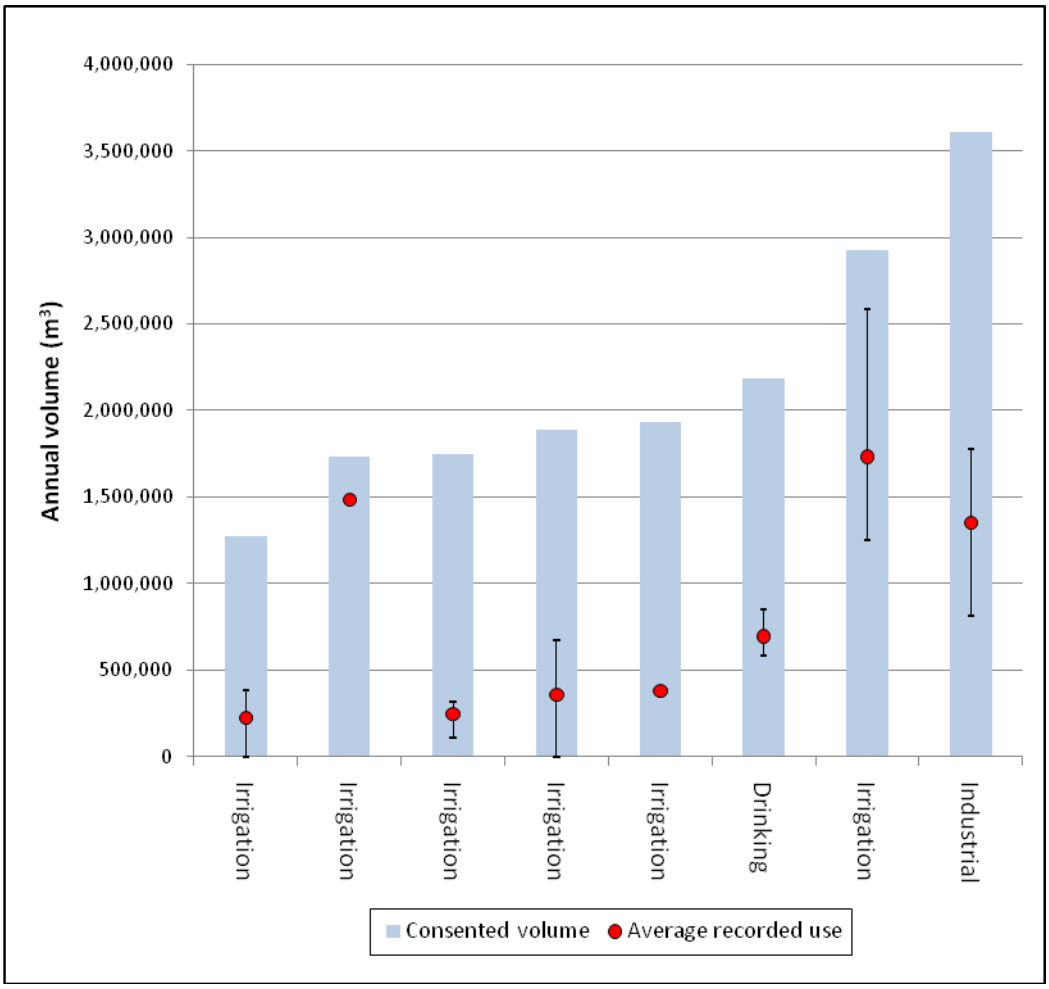
Environment Canterbury

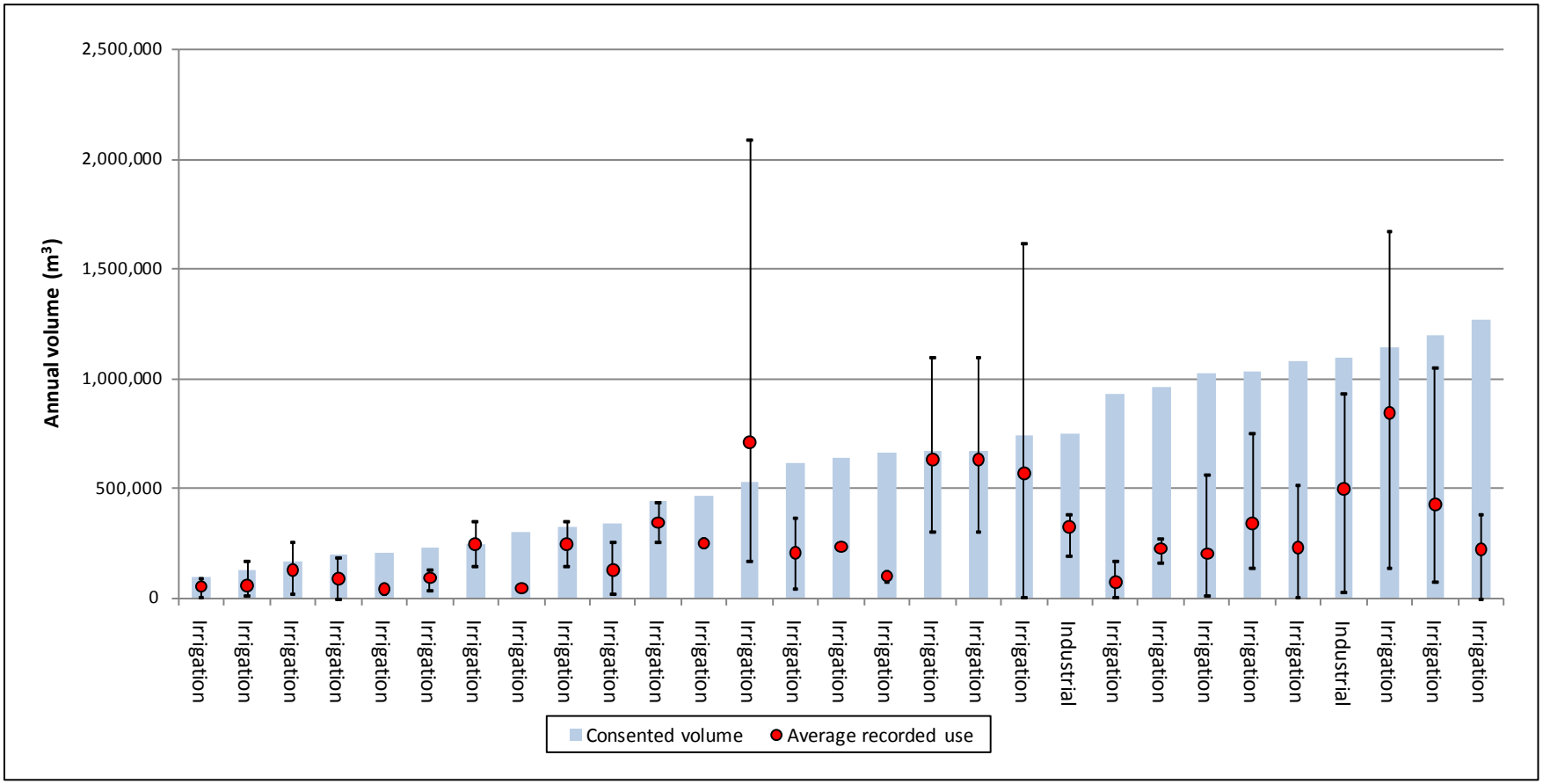
Actual Water Use

Primary use	Flow rate (ℓ/s)	Sum of consented annual rate (m^3/year)	Sum of actual annual water use (m^3/year)	Actual use as a percentage of consented volume
Drinking		384,542,395	122,194,958	32%
Industrial	<50	64,032,795	27,996,341	44%
	50-150	43,268,540	19,546,176	45%
	>150	210,707,620	78,976,348	37%
Industrial Total		318,008,955	126,518,864	40%
Irrigation	<50	574,242,722	224,582,956	39%
	50-100	618,915,246	410,318,141	66%
	100-200	436,574,696	113,370,699	26%
	>200	1,953,665,282	1,413,056,526	72%
Irrigation Total		3,583,397,946	2,161,328,322	60%
Stock		704,588,566	420,388,473	60%
Grand Total		**4,990,537,862**	**2,830,430,617**	**57%**

Note: This Summary excludes non-consumptive takes
Stock percentage is based on national estimate

At the time of supplying water use data for this project, ECan was in the process of implementing a new and improved database. The process of transferring the data into the new databases requires rigorous checks to be completed to ensure that the data has been transferred correctly. To meet the timelines of this project, ECan has performed the required data checks to guarantee the integrity of the data supplied by ECan are fit for the purpose of this project. However, ECan cannot guarantee the data accuracy, completeness, or its suitability for any other purpose. ECan will not be held liable for any issues or problems that arise from other persons using this data and information for any other purpose than as used in this document.



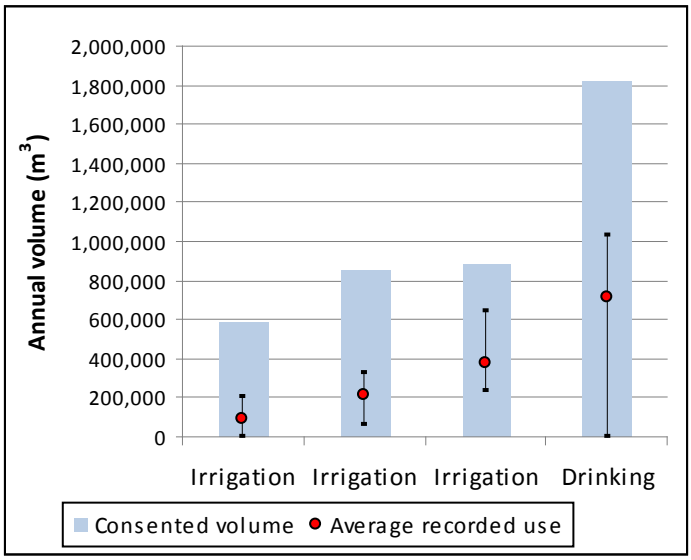


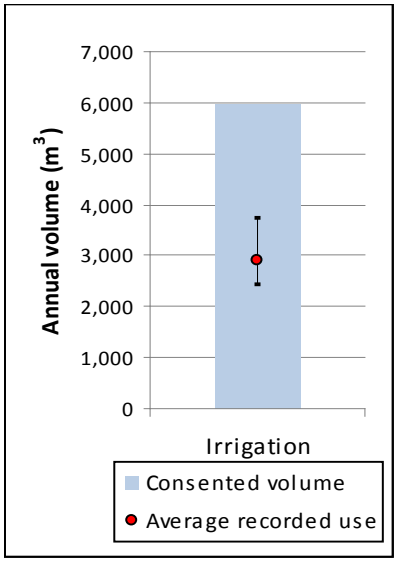
Environment Southland

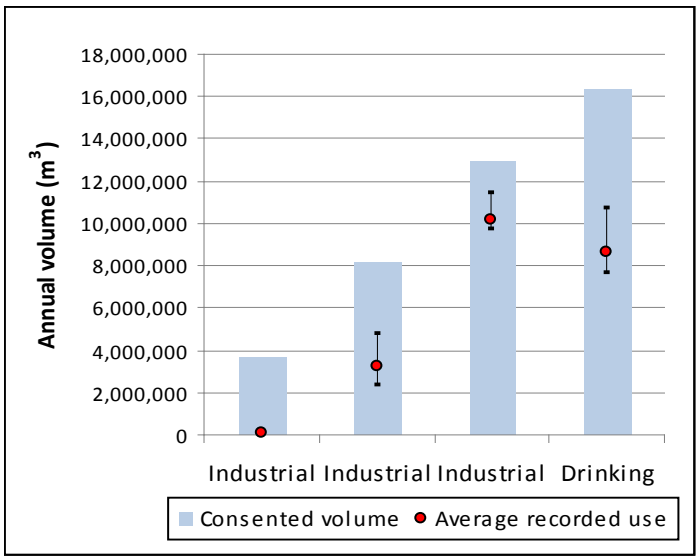
Actual Water Use

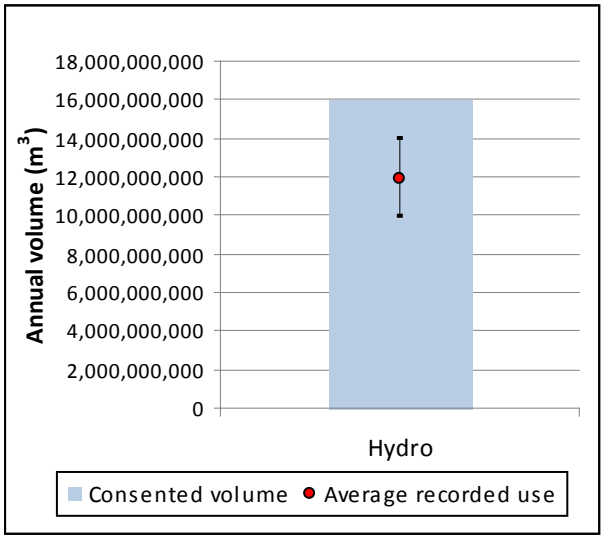
Primary use	Flow rate (ℓ/s)	Sum of consented annual rate (m^3/year)	Sum of actual annual water use (m^3/year)	Actual use as a percentage of consented volume
Drinking	<100	19,702,787	7,742,638	39%
	>100	16,425,000	8,658,417	53%
Drinking Total		36,127,787	16,401,055	45%
Industrial	<300	34,809,647	7,198,747	21%
	>300	12,994,000	10,213,146	79%
Industrial Total		47,803,647	17,411,894	36%
Irrigation	<50	9,088,335	4,417,436	49%
	>50	26,132,753	7,235,374	28%
Irrigation Total		35,221,088	11,652,810	33%
Stock		23,425,724	13,976,815	60%
Hydro		16,039,296,000	11,853,846,154	74%
Grand Total		**16,181,874,245**	**11,913,288,727**	**74%**

Note: This Summary excludes non-consumptive takes
Stock percentage is based on national estimate







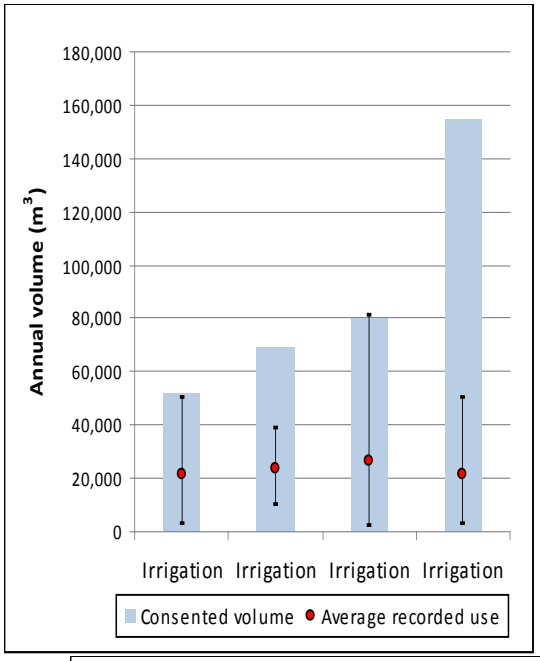


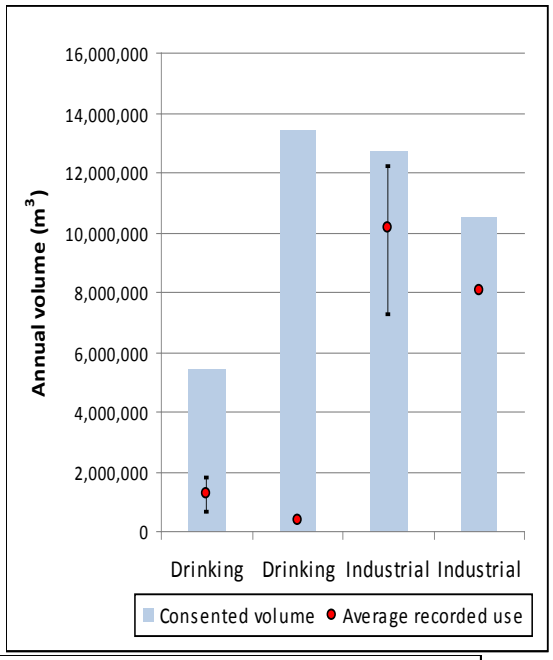
Environment Waikato

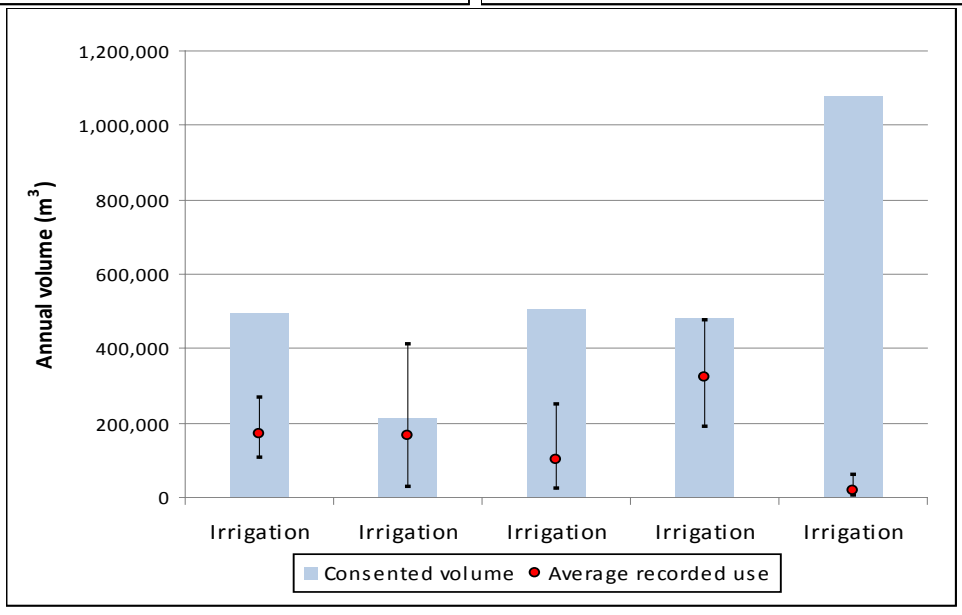
Actual Water Use

Primary use	Flow rate (ℓ/s)	Sum of consented annual rate (m^3/year)	Sum of actual annual water use (m^3/year)	Actual use as a percentage of consented volume
Drinking		248,480,777	32,007,440	13%
Industrial		328,099,814	256,508,434	78%
Irrigation	<50	23,346,619	7,138,065	31%
	>50	36,463,760	14,633,379	40%
Irrigation Total		59,810,379	21,771,444	36%
Stock		4,994,562	3,096,555	62%
Grand Total		**641,385,532**	**313,383,873**	**49%**

Note: This Summary excludes non-consumptive takes





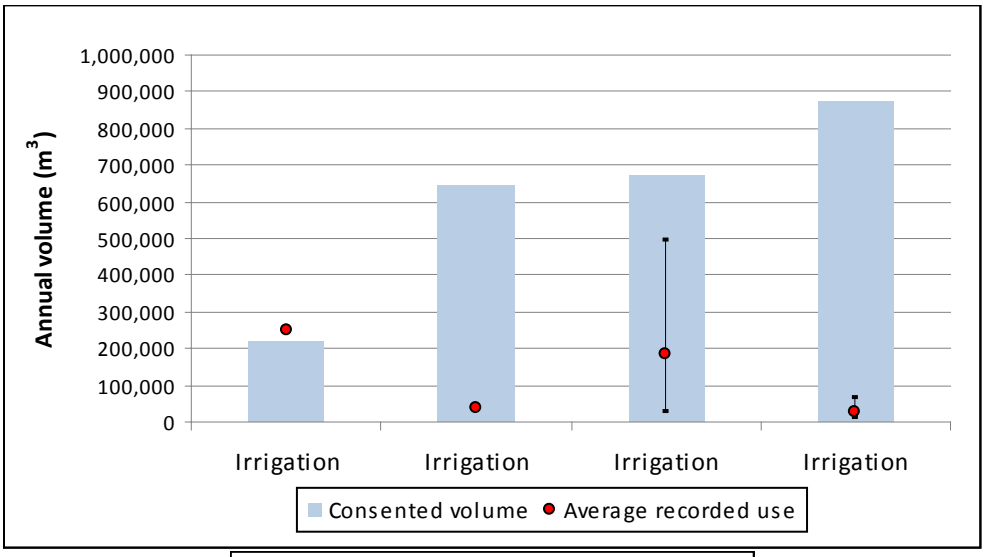


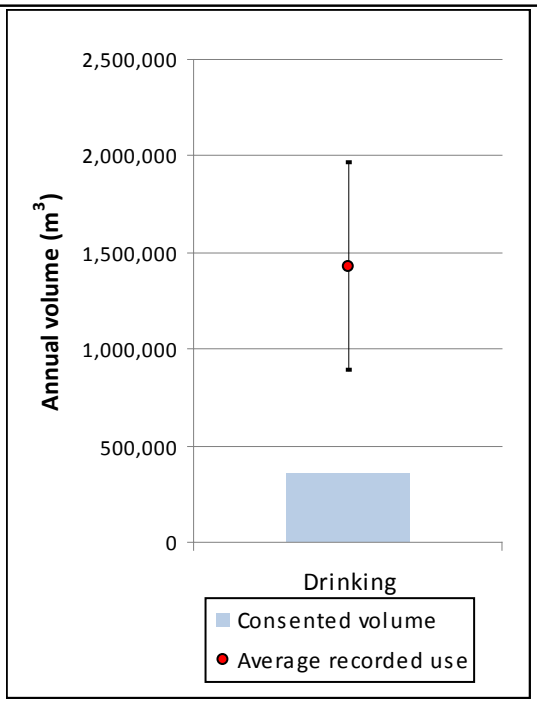
Gisborne District Council

Actual Water Use

Primary use	Sum of consented annual rate (m^3/year)	Sum of actual annual water use (m^3/year)	Actual use as a percentage of consented volume
Drinking	14,566,924	57,699,910	396%
Industrial	314,678	84,941	27%
Irrigation	17,058,222	3,430,259	20%
Grand Total	**31,939,824**	**61,215,110**	**192%**

Note: This Summary excludes non-consumptive takes.
Industrial percent is based on HBRC data.
The water use analysis for drinking is based on water use records from single municipal take consent. However, the water meter which measures this municipal consent also measures a city water supply for which Gisborne District Council staff consider they have an existing use right (i.e there is no additional consented volume). Therefore the actual water use is much higher than the consented annual volume.



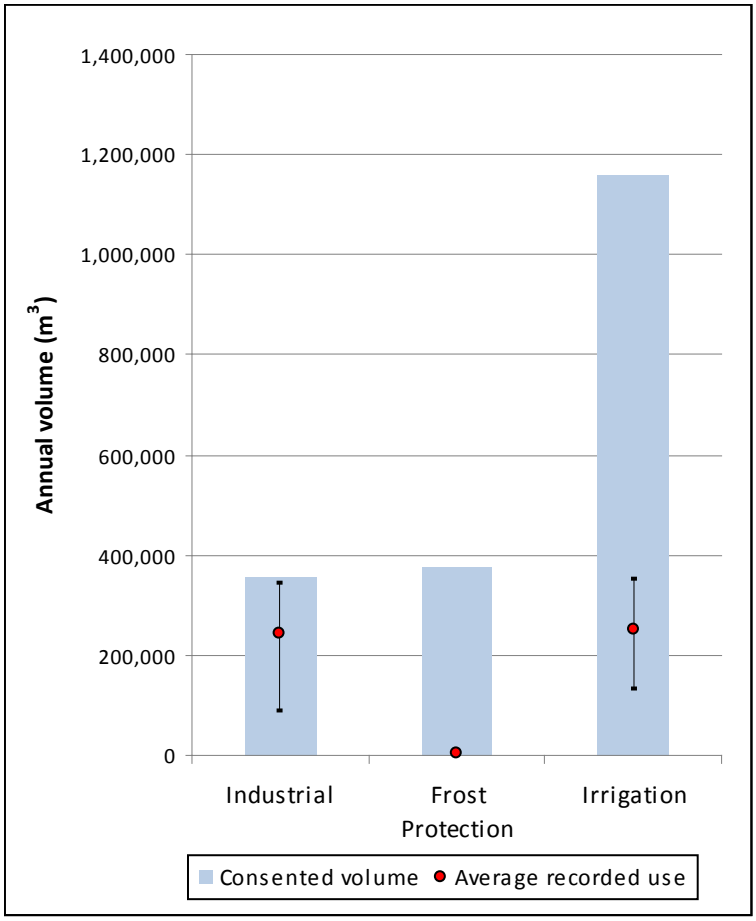


Greater Wellington Regional Council

Actual Water Use

Primary use	Flow rate (ℓ/s)	Sum of consented annual rate (m^3/year)	Sum of actual annual water use (m^3/year)	Actual use as a percentage of consented volume
Drinking	<500	91,949,524	54,131,467	59%
	>500	181,395,000	91,747,040	51%
Drinking Total		273,344,524	145,878,507	53%
Industrial		11,777,134	7,920,513	67%
Irrigation		133,092,161	28,389,566	21%
Stock		53,391,433	31,855,673	60%
Grand Total		471,605,251	214,044,260	45%

Note: This Summary excludes non-consumptive takes
Drinking percentage is based on TRC Data
Stock percentage is based on national estimate

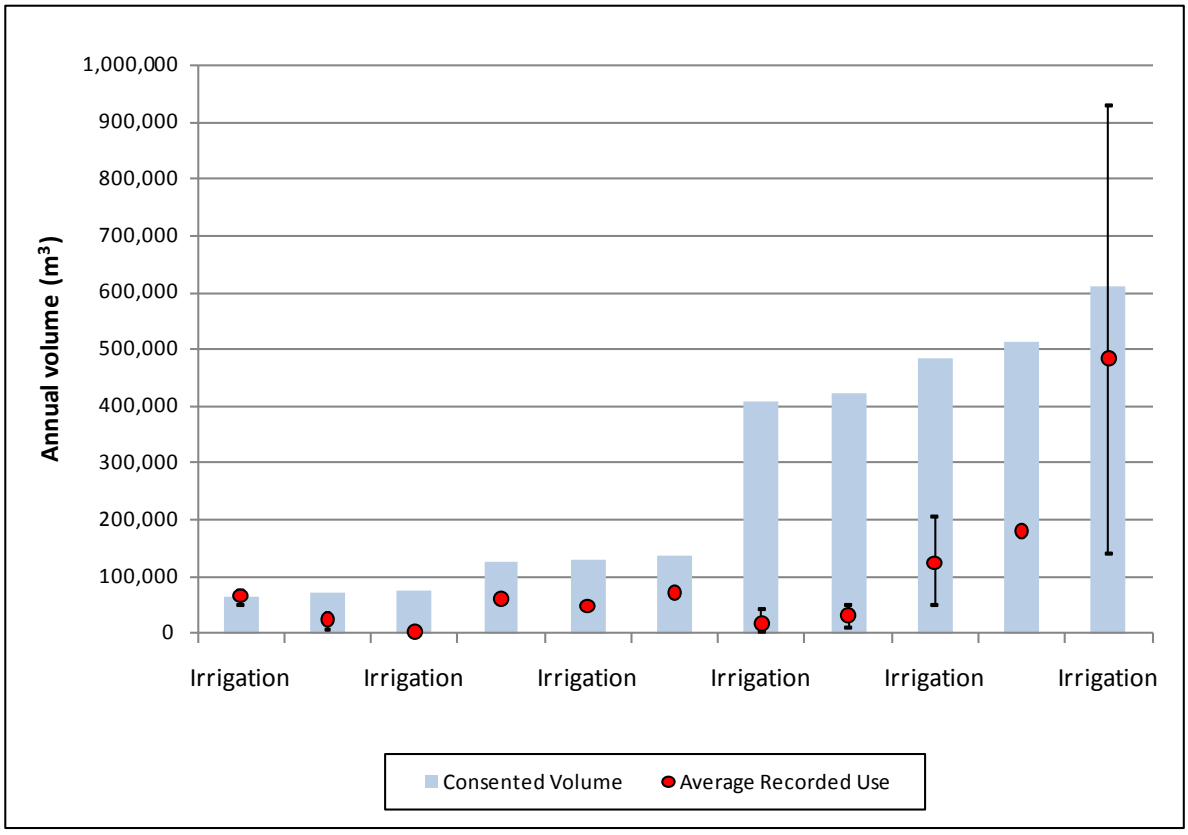


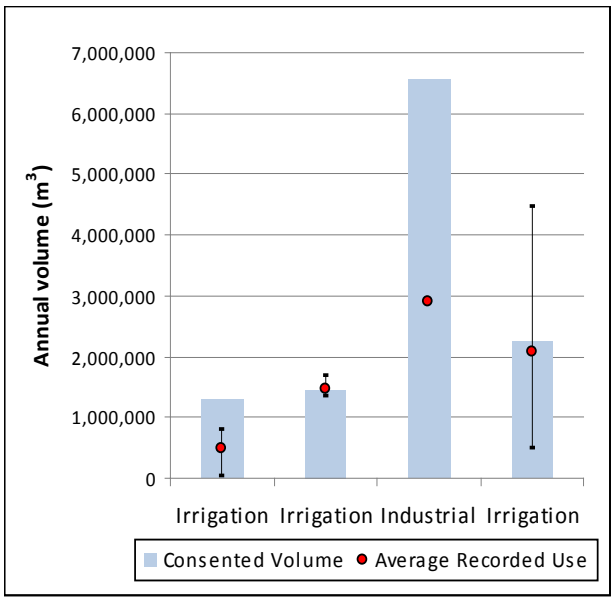
Hawke's Bay Regional Council

Actual Water Use

Primary use	Flow rate (ℓ/s)	Sum of consented annual rate (m^3/year)	Sum of actual annual water use (m^3/year)	Actual use as a percentage of consented volume
Drinking		82,127,544	48,455,251	59%
Industrial		117,447,306	31,710,773	27%
Irrigation	<50	111,875,132	53,309,940	48%
	50 - 100	30,312,474	6,544,598	22%
	100 - 200	13,810,863	9,231,814	67%
	>200	20,596,300	12,367,831	60%
Irrigation Total		176,594,770	81,454,183	46%
Stock		6,571,100	2,298,752	35%
Grand Total		**382,740,720**	**163,918,959**	**43%**

Note: This Summary excludes non-consumptive takes

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Irrigation
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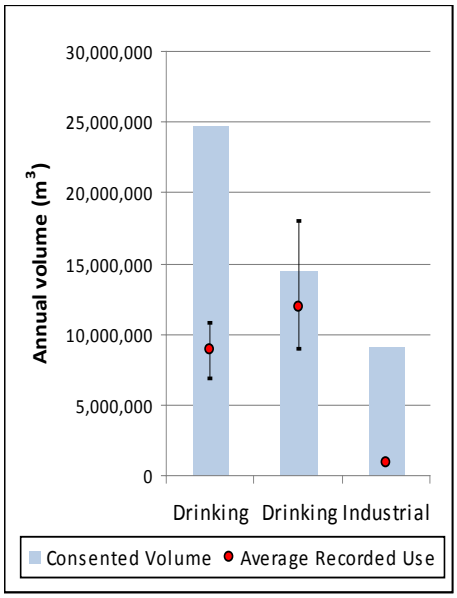
Consented Volume
Average Recorded Use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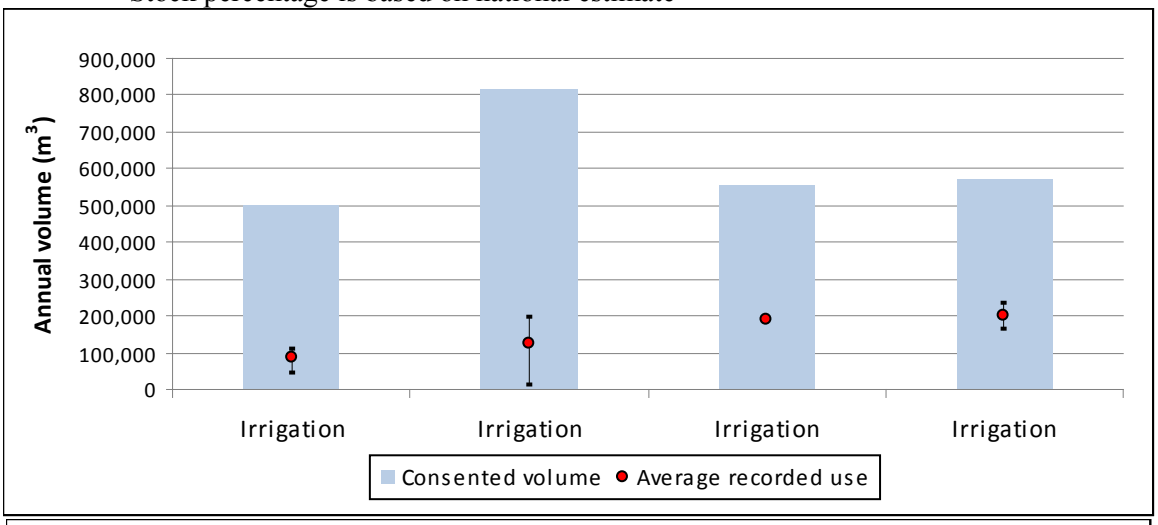
Annual volume (m3)
Drinking
Drinking
Industrial
Consented Volume
Average Recorded Use

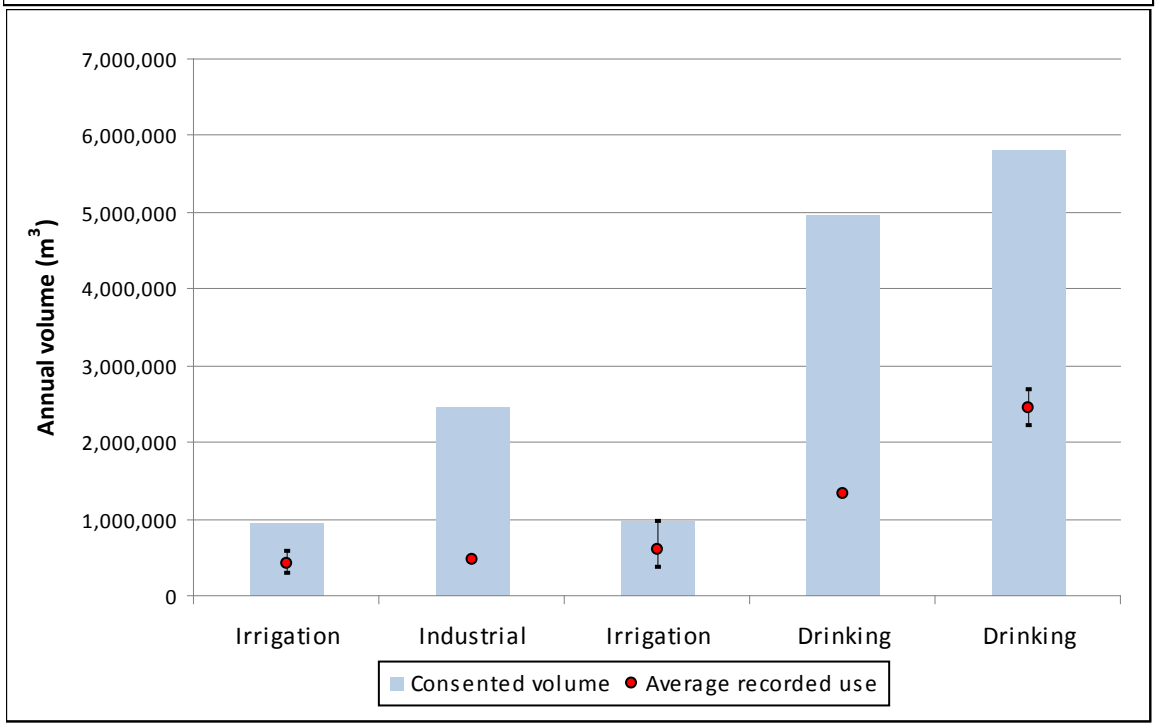
Horizons Regional Council

Actual Water Use

Primary use	Flow rate (ℓ/s)	Sum of consented annual rate (m^3/year)	Sum of actual annual water use (m^3/year)	Actual use as a percentage of consented volume
Drinking		107,187,878	36,726,745	34%
Industrial		48,005,615	8,889,531	19%
Irrigation	<100	84,637,160	21,159,290	25%
	>100	14,887,328	6,308,617	42%
Irrigation Total		99,524,488	27,866,857	28%
Stock		9,532,178	5,687,316	60%
Grand Total		264,250,159	79,170,449	30%

Note: This Summary excludes non-consumptive takes
Stock percentage is based on national estimate



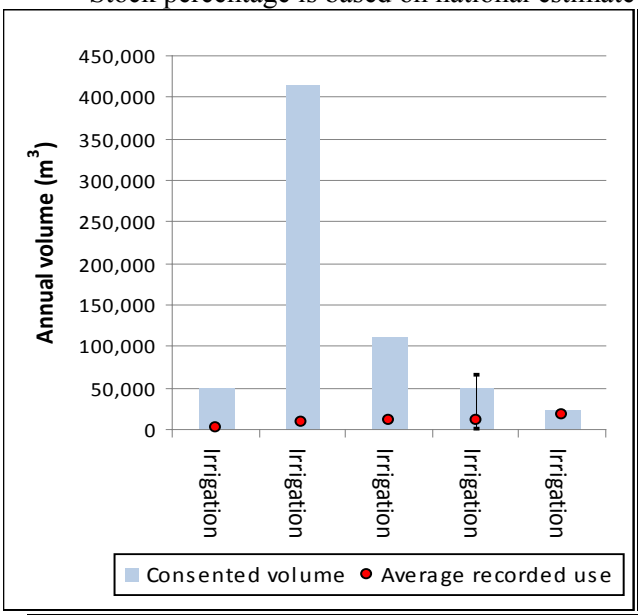


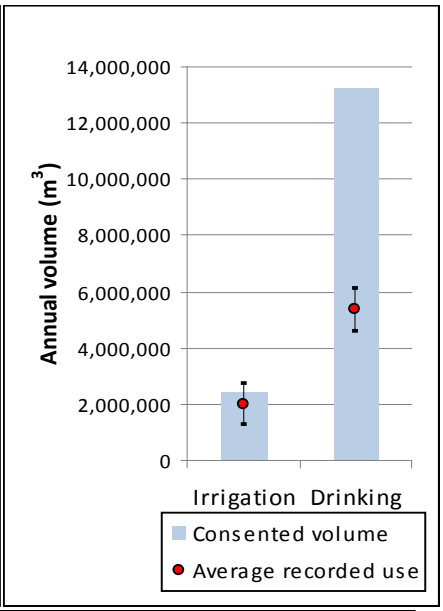
Marlborough District Council

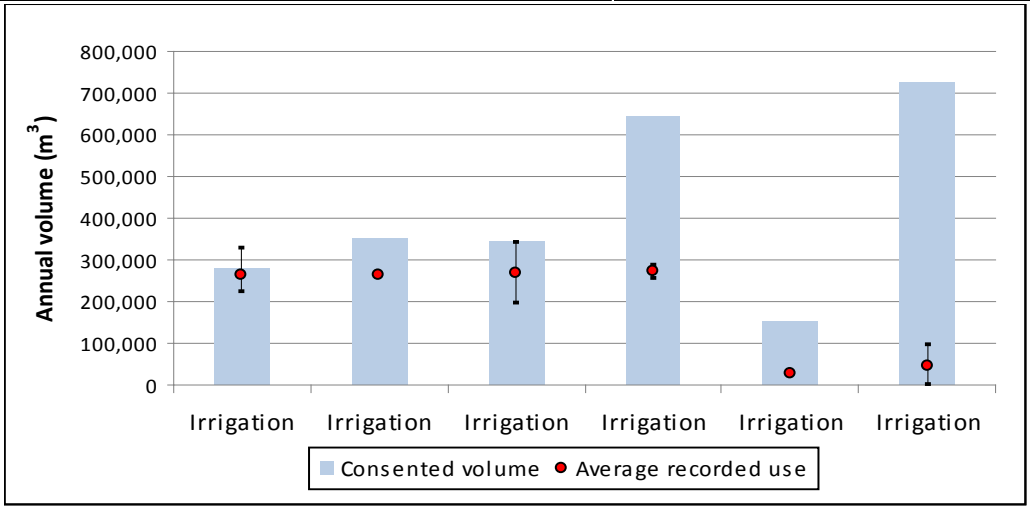
Actual Water Use

Primary use	Flow rate (ℓ/s)	Sum of consented annual rate (m^3/year)	Sum of actual annual water use (m^3/year)	Actual use as a percentage of consented volume
Drinking		24,604,948	10,021,141	41%
Industrial	<50	5,279,454	4,751,509	90%
	50-150	1,642,500	427,050	26%
	>150	11,037,600	4,194,288	38%
Industrial Total		17,959,554	9,372,847	52%
Irrigation	<10	27,017,135	8,896,728	33%
	10 - 50	62,641,566	32,362,265	52%
	>50	106,202,644	39,098,847	37%
Irrigation Total		195,861,345	80,357,840	41%
Grand Total		**238,425,847**	**99,751,829**	**42%**

Note: This Summary excludes non-consumptive takes
Industrial percentages are based on ECan Data
Stock percentage is based on national estimate







Nelson City Council

Actual Water Use

Primary use	Sum of consented annual rate (m^3/year)	Sum of actual annual water use (m^3/year)	Actual use as a percentage of consented volume
Drinking	29,033,004	7,422,106	26%
Industrial	126,963	18,249	14%
Irrigation	149,744	88,548	59%
Stock	8,263	4,930	60%
Grand Total	**29,317,974**	**7,533,833**	**26%**

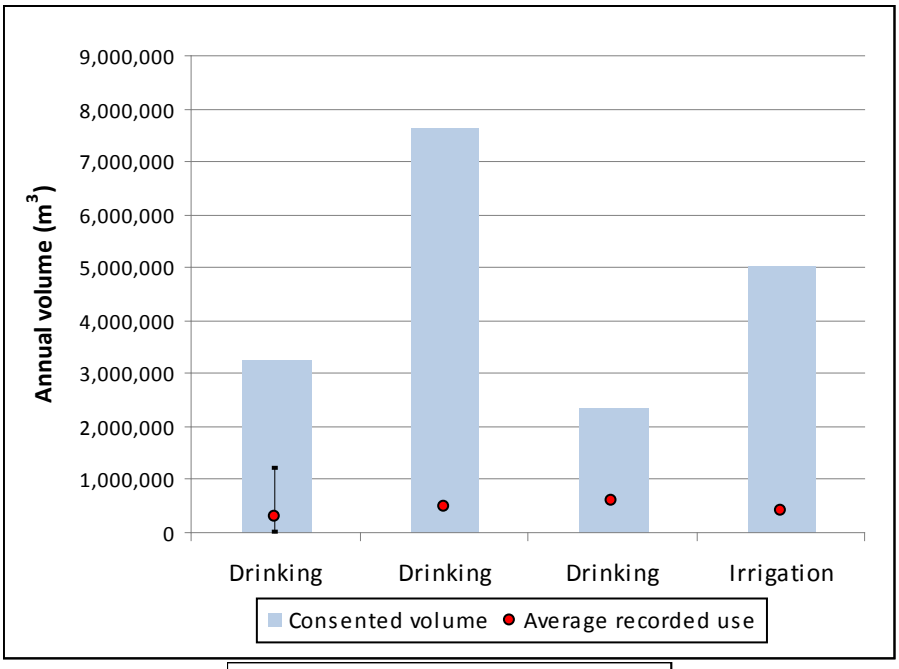
Note: This Summary excludes non-consumptive takes
Stock percentage is based on national estimate
Other percentages is based on TDC data

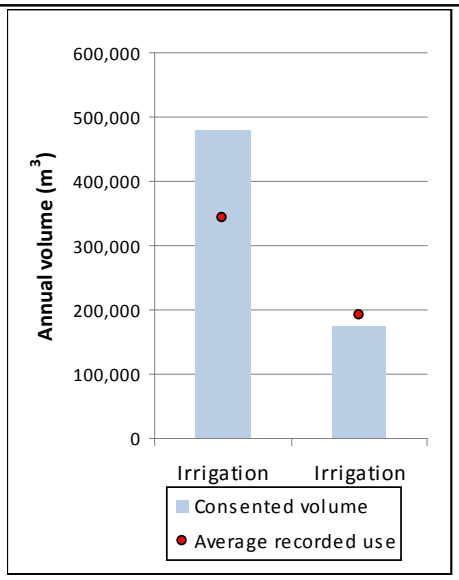
Northland Regional Council

Actual Water Use

Primary use	Sum of consented annual rate (m^3/year)	Sum of actual annual water use (m^3/year)	Actual use as a percentage of consented volume
Drinking	57,552,399	7,926,637	14%
Industrial	15,645,634	15,689,293	100%
Irrigation	51,735,037	32,520,726	63%
Stock	1,140,312	680,360	60%
Grand Total	**126,073,382**	**56,817,015**	**45%**

Note: This Summary excludes non-consumptive takes
Industrial percentage is based on ARC data
Stock percentage is based on national estimate



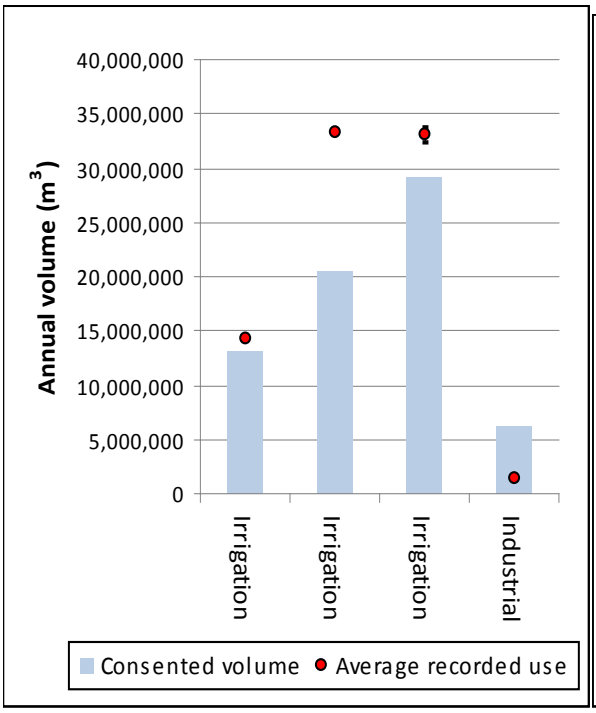


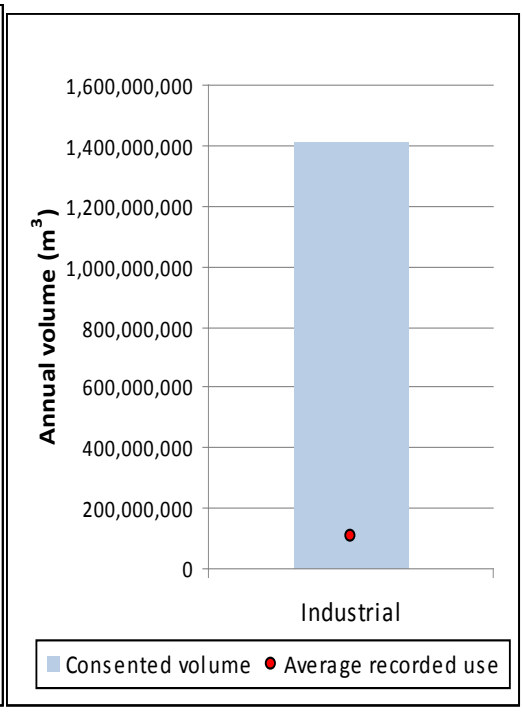
Otago Regional Council

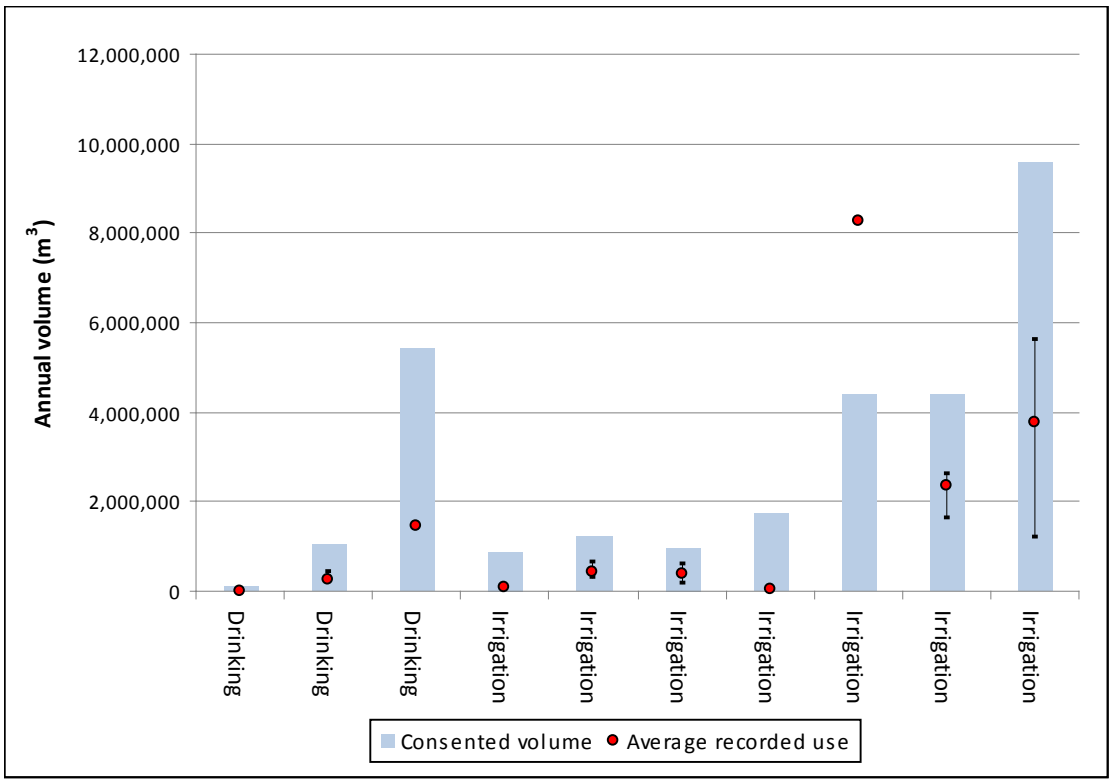
Actual Water Use

Primary use	Flow rate (ℓ/s)	Sum of consented annual rate (m^3/year	Sum of actual annual water use (m^3/year)	Actual use as a percentage of consented volume
Drinking	0-50	45,340,005	7,707,801	17%
	51-200	64,953,059	16,238,265	25%
	>200	84,645,665	22,854,330	27%
Drinking Total		194,938,729	46,800,395	24%
Industrial		1,057,663,600	222,109,356	21%
Irrigation	0-200	622,940,628	130,817,532	21%
	201-1000	210,919,766	198,264,580	94%
	>1000	364,573,619	463,008,496	127%
Irrigation Total		1,198,434,012	792,090,607	66%
Stock		3,832,332	2,286,537	60%
Grand Total		2,454,868,674	1,063,286,896	43%

Note: This Summary excludes non-consumptive takes
Stock percentage is based on national estimate





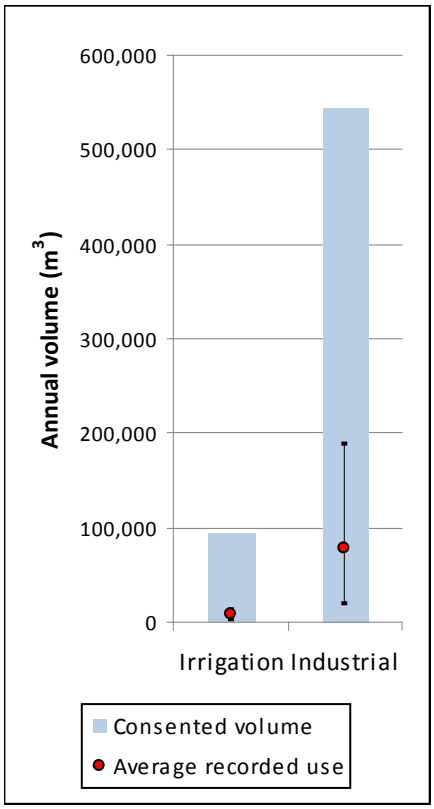


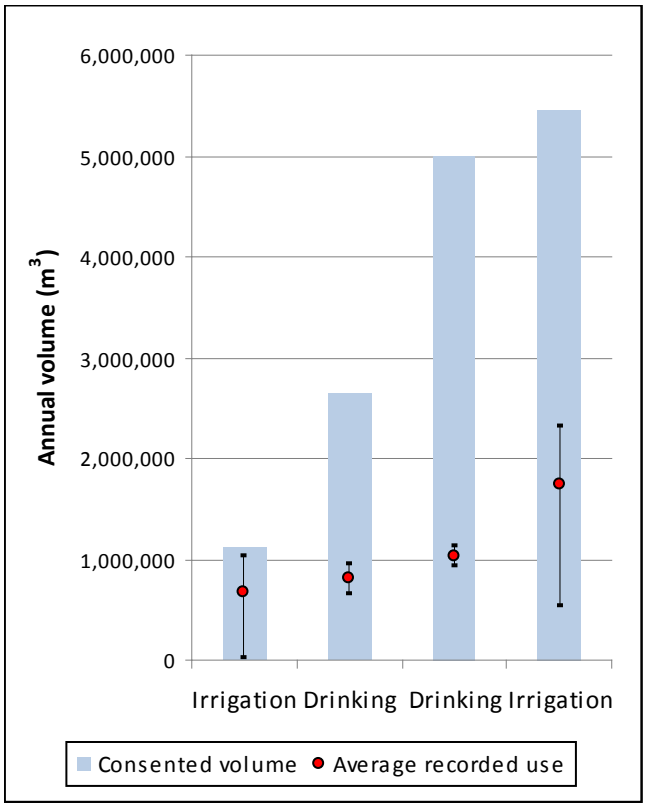
Tasman District Council

Actual Water Use

Primary use	Flow rate (ℓ/s)	Sum of consented annual rate (m^3/year)	Sum of actual annual water use (m^3/year)	Actual use as a percentage of consented volume
Drinking		20,822,048	5,323,027	26%
Industrial		15,818,625	2,273,635	14%
Irrigation	<200	71,489,965	42,273,938	59%
	>200	7,527,040	2,263,119	30%
Irrigation Total		79,017,005	44,537,057	56%
Stock		38,948	23,238	60%
Grand Total		**115,696,626**	**52,156,956**	**45%**

Note: This Summary excludes non-consumptive takes
Stock percentage is based on national estimate



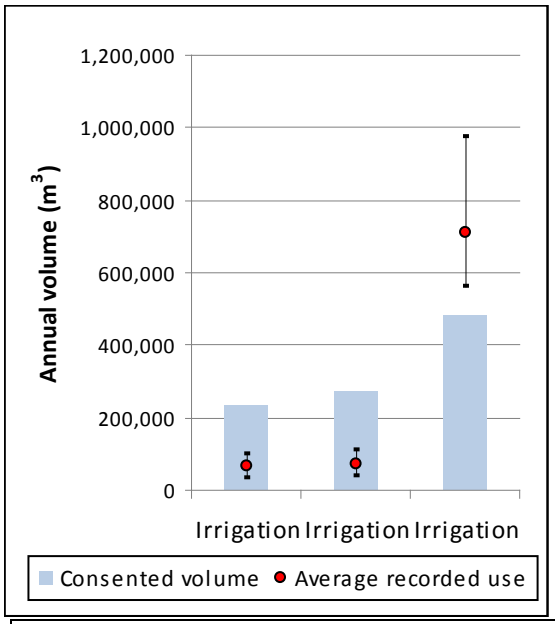


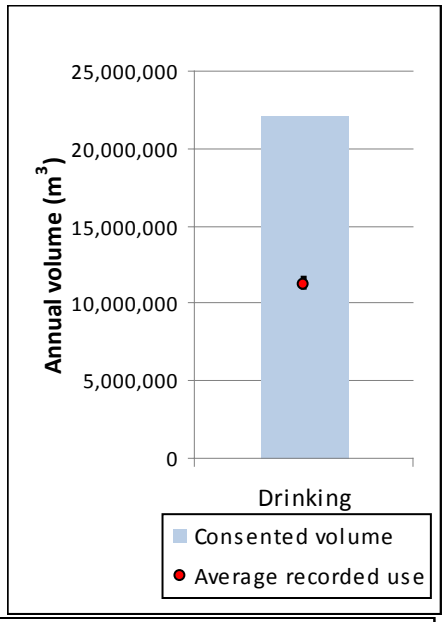
Taranaki Regional Council

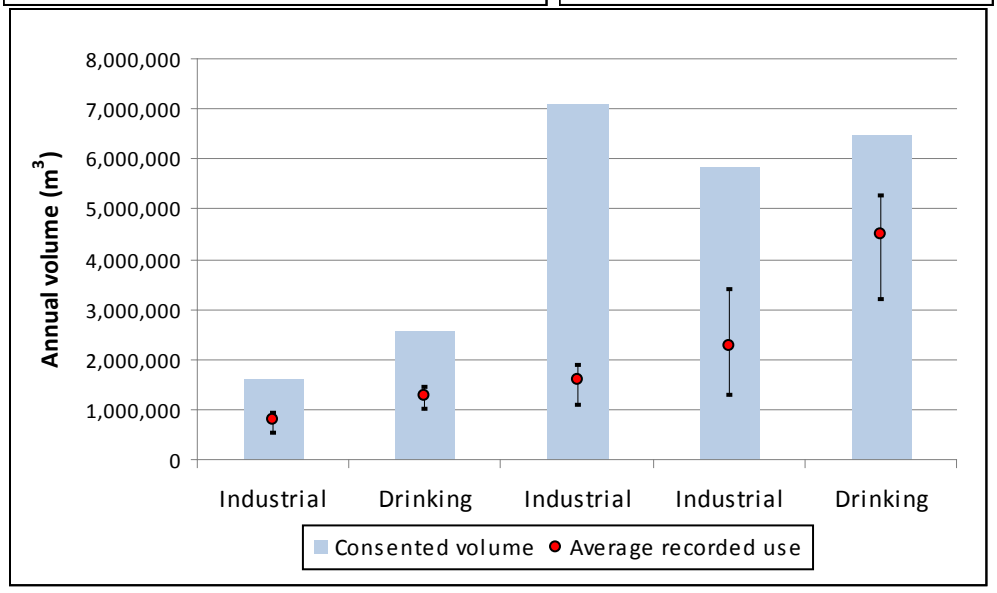
Actual Water Use

Primary use	Flow rate (ℓ/s)	Sum of consented annual rate (m^3/year)	Sum of actual annual water use (m^3/year)	Actual use as a percentage of consented volume
Drinking	<500	37,679,554	22,182,274	59%
	>500	22,135,680	11,195,916	51%
Drinking Total		59,815,234	33,378,190	56%
Industrial	<200	30,562,332	14,867,453	49%
	>200	50,500,680	15,446,949	31%
Industrial Total		81,063,012	30,314,402	37%
Irrigation		12,888,151	8,629,149	67%
Stock		1,018,871	607,903	60%
Grand Total		**154,785,267**	**72,929,644**	**47%**

Note: This Summary excludes non-consumptive takes
Stock percentage is based on national estimate







West Coast Regional Council

Actual Water Use

Primary use	Flow rate (ℓ/s)	Sum of consented annual rate (m^3/year)	Sum of actual annual water use (m^3/year)	Actual use as a percentage of consented volume
Drinking	<50	7,789,084	11,449,954	147%
	50-150	15,800,512	12,324,399	78%
	>150	2,784,600	1,977,066	71%
Drinking Total		26,374,196	25,751,419	98%
Industrial	<200	94,615,452	46,361,571	49%
	>200	104,417,229	32,369,341	31%
Industrial Total		199,032,681	78,730,912	40%
Irrigation		17,825,620	11,943,165	67%
Grand Total		243,232,497	116,425,497	48%

Note: This Summary excludes non-consumptive takes
Irrigation and Industrial percentages are based on TRC data