

**Upper Waitaki Limit Setting Process:
Social-economic Profile of the Waitaki Catchment**

Prepared for Environment Canterbury

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Table of Contents

1	Introduction	1
2	Economy and employment of the three districts	2
2.1	Mackenzie District.....	8
2.2	Waitaki District.....	10
2.3	Waimate District	11
3	Population and communities	12
3.1	Overview of communities and population change.....	12
3.2	Lake Tekapo and Mt Cook.....	13
3.3	Twizel	14
3.4	Omarama	15
3.5	Otematata	16
3.6	Kurow	16
3.7	Lower Waitaki	17
3.8	School rolls	18
3.9	Social issues.....	19
3.10	Stock, drinking and wastewater.....	20
4	Outdoor recreation	21
4.1	Recreation in the Upper Waitaki	21
4.2	Outdoor recreation in the Lower Waitaki.....	23
5	Concluding comment	26
	References	27
	Attachment 1 Maps of Catchment and sub catchments	30
	Attachment 2 Method for Estimation of Direct Impacts	33

1 Introduction

This social profile summarises the current state of the Waitaki Catchment in South Canterbury, South Island of New Zealand (see Maps in attachment 1). The profile provides a baseline from which future water management options can be assessed. It forms a part of the social-economic technical assessment commissioned by ECAN to assist the two Waitaki Catchment zone committees establish water quality limits for the Catchment as part of a sub-regional plan. Water quantity will continue to be managed through the Waitaki Catchment Water Allocation Regional Plan.

For the purposes of this technical assessment the whole of the catchment is considered but divided into the Upper and Lower Catchments. The Upper Catchment lies above the Waitaki dam, including lakes Waitaki, Aviemore and Benmore, and the tributaries of these lakes. Most of the Upper Catchment flows into Lake Benmore and this area is divided into the Haldon Arm and Ahuriri Arm of the Lake (See Map 1 in Attachment 1). The Lower Catchment has one main tributary in the Hakataramea River, plus a number of additional streams, particularly on the south side in an area commonly termed the Waitaki Valley. Also of particular interest for nutrient management is the North Fan, comprising the fan area to the north of the river, which has streams following into it including the Elephant Hill Stream and the Waikakahi Stream. The southern fan area lies in the Otago region, outside the jurisdiction of ECAN, and is not considered here other than as part of Waitaki District (see Map 2 in Attachment 1).

Information is provided here about the social-economic status of the Catchment area and within it the town of Twizel and the smaller settlements (Mt Cook, Lake Tekapo, Omarama, Otematata, Kurow, Duntroon and Glenavy), where services such as health, education, retail and other services are delivered (see Map 3 in Attachment 1 for location of settlements). Rural areas are either discussed as a whole, or are split into the Upper Waitaki and the Lower Waitaki to draw out any important differences across the Catchment. Specific information is provided about the sub catchments as relevant to the assessment. Where available, trends (over the last 10-12² years) are described, in order to provide a picture of recent changes in the Catchment. Historical data are also referred to for a sense of longer-term trends.³

The baseline profile was developed from a wide range of data sources comprising published information, official statistics including the 2001, 2006 and 2013 censuses, and other documentary sources including local histories and manuscripts.

For some data it is not possible to separate the Catchment from the wider Districts (Mackenzie, Waitaki and Waimate) in which it is located and where local government services are provided.⁴ Much available data is at the District level, so while the main focus is on the Catchment, this profile includes some District data on land use and major social-economic trends.

² Normally the census is held every 10 years but the census expected in 2011 was held in 2013 due to the Christchurch earthquakes, so a 12 year intercensal period applies for the period 2001 to 2013.

³ The authors note that the Catchment, its people and communities are highly photogenic but have decided not to include photos in this report. A visual appreciation is easily available on line, eg <https://www.google.co.nz/search?q=Waitaki+Catchment+pics&client=firefox-a&hs=2Nt&rls=org.mozilla:en-US:official&channel=nts&tbn=isch&tbo=u&source=univ&sa=X&ei=ctrVJjsD-LTmgWj8oG4Cw&ved=0CBOQsAQ&biw=1920&bih=969>

⁴ Data such as agricultural census data are available at the district level. Districts also provide considerable economic analysis at the district level. It is also important to note that Statistics NZ census boundaries do not fit neatly with catchment boundaries, particularly on the north side of the lower catchment.

Updating of this social-economic profile is continuing through the planning process for the Catchment, capturing wherever possible the views of local people about their communities and the aspects of the Catchment that they value, which will be integrated with the different technical analyses. Further information was added from interviews and discussions in the assessment area, including discussions at public meetings and community workshops. Information was also added from the analysis of an on-line survey covering recreation uses in the Basin in early 2014, and from a detailed analysis of the 2013 census results. These latter two sets of data are available in separate reports in support of this profile report.

The profile reflects a wide range of social, economic and cultural⁵ values present in the Catchment. These values are also the subject of complementary technical analyses such as hydrology, water quality, ecology and cultural assessment. It is also important to note that values vary between people and groups, and change over time as a result of current conditions. Major value areas covered in this profile include those associated with:

- the productive and consumptive uses of water that provide reliable irrigation, drinking and stock water supplies, enabling people to meet social needs and gain economic livelihoods from a mix of farming systems
- the people and communities of the Catchment, their social organisation, identities, ways of life and historical linkages to water
- the recreational, ecological and intrinsic values of rivers, streams, groundwater and drains, lakes and wetlands, and the cultural and aesthetic values associated with them.

2 Economy and employment of the three districts

In a predominantly rural area, such as the Waitaki Catchment, land and resource uses drive the economy which in turn drives employment and the size and composition of the population, and the services and community life that sustain social and economic wellbeing for residents.⁶ In this section we consider resource uses, the catchment economy and aspects of the three districts, as each district includes a significant part of the Catchment.

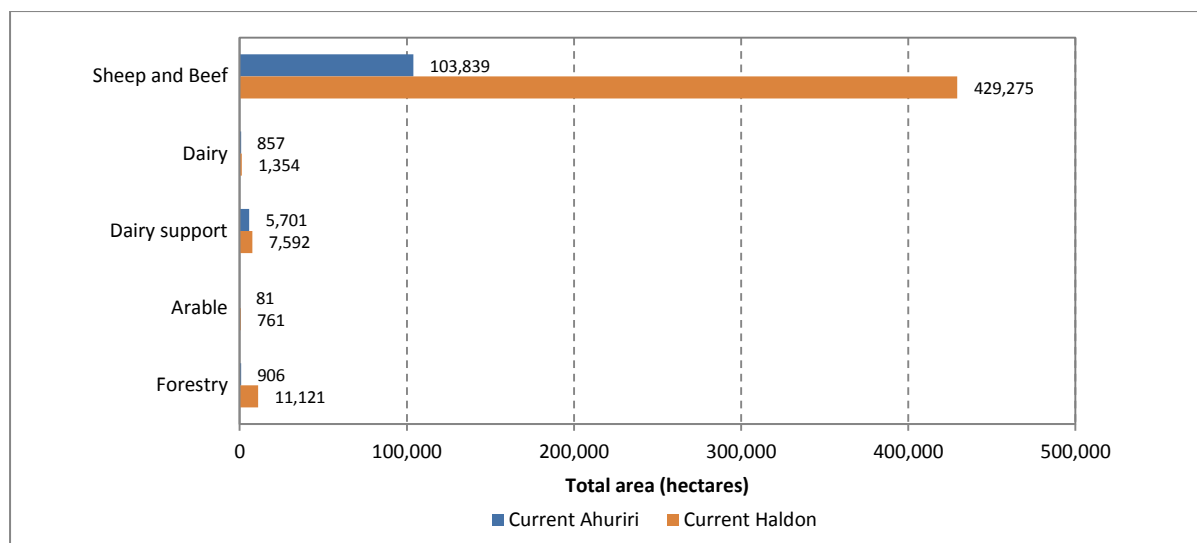
Across the Catchment, the economy is driven by pastoral farming systems. These include extensive, fine-wool sheep production, sheep and cattle farms, and dairy production. There is a small area of cropping and horticulture including some viticulture in the lower Catchment. The lower plains, including the North Fan, are largely irrigated and the land is used primarily for dairy farming. The upper Catchment has significant irrigation (13,000 ha) and dairy farming is a new feature (3700 ha). There are also significant areas of conservation land, ranging from mountain environments to grasslands and braided rivers. In the upper Catchment irrigation is a significant factor in the sustainability of traditional pastoral farming properties, providing additional summer and winter feed.⁷ There are considerable takes to irrigation schemes out of the lower catchment (Morvey/Glenavy and North Otago irrigation companies). Further information on land uses in the upper catchment is provided in Figure 1.

⁵ Maori cultural values are discussed in a separate report by Tipa (2014).

⁶ A primary purpose of the Resource Management Act (1991, s5) is sustainable management that enables “people and communities to provide for their social, economic and cultural well being ...”.

⁷ Pastoral farming is limited in scope by factors such as aspect, slope, altitude and temperature, and soil moisture deficits (Scott et al., 1995).

Figure 1: Land use upper Waitaki



Farm viability, and associated rural economy and communities in the Catchment, are limited by periodic drought, rabbits, woody weeds and hieracium. The semi-arid land of the Mackenzie Basin and Hakataramea Valley is prone to infestation by rabbits which have negative effects on land-based businesses.⁸ Counts of rabbit numbers in the Mackenzie District between 1998 and 2008, show that since the introduction of the Rabbit Calicivirus Disease (RCD)⁹ the average population of rabbits per kilometre grew fourfold from 1.40 to 5.53, and this increase is likely to continue in semi-arid parts of the District.¹⁰

These production issues have led to fragile farm finances, a loss of labour for pest management and a general cutback of farm labour on sheep and beef properties over several decades, with negative flow-on effects for rural services and communities. Central and regional governments have responded to land management and resulting socio-economic issues by costly interventions such as the Rabbit and Land Management Programme (RLMP). Alongside farmer and community initiatives they have also invested in irrigation schemes in the Catchment since the 1970s. Irrigation has become an important component of high country systems, with additional pasture growth and reliability coming from reliable water supplies, providing for greater ability to sustain production and finish animals. Development of more intensive dryland systems has been another feature of farming in the Basin and Hakataramea Valley, with, for example, ryecorn crops for two years followed by Lucerne pastures. Modern Lucerne varieties have proven significantly more productive when handled correctly, and are making previously unproductive land more viable for sheep and beef systems.

⁸ The negative effects of rabbits on land-based businesses include: short term loss of grazing available to livestock, long term loss of grazing from the modification of existing vegetation, financial costs of rabbit control, major disruption to grazing management from spelling land treated with 1080 until sufficient rain has fallen to make it safe for livestock, loss of soil at high densities, and the effect of high rabbit populations on maintaining high predator numbers with significant costs being incurred in situations where predators carry bovine tuberculosis (Lough, R.S. 2009: 9).

⁹ RCD or Rabbit Calicivirus Disease was introduced illegally by farmers in 1997 following refusal by the government to introduce it <http://www.pce.parliament.nz/publications/all-publications/the-rabbit-calicivirus-disease-rcd-saga-a-biosecurity-bio-control-fiasco-4>

¹⁰ Reported by Environment Canterbury and cited by Lough, R.S. (2009: 12-13).

Dairy systems followed irrigation in the lower catchment since the 1970s¹¹ but are a much more recent feature of the Upper Catchment, with the first large-scale farms developed there in the early 2000s. Proposals for further large scale dairy farms in the Upper Catchment have raised concerns among local residents and tourism operators that the structures and effluent of ‘factory farming’ could put pressure on the ecosystems of local lakes and rivers and irrevocably change iconic landscapes, damaging the area’s reputation as a visitor attraction.¹² There are now four dairy farms in the Upper Catchment covering approximately 3700 ha. These systems require irrigation, and although not as productive as lowland dairy properties because of the more variable climate and longer winters, are still profitable operations. There are now opportunities also for dairy support in the Upper Catchment, and while there are some specialist support blocks, much of it takes place within sheep and beef properties, adding to their economic resilience. Furthermore, Lough observes that conversion of pastoral land to dairying in Southland and the Amuri Basin has made the habitat less favourable for rabbits, and expects the development of more intensive land use in the Mackenzie Basin will have a similar effect.¹³

Revenue for the farming and forestry sector is estimated at currently \$190 million, GDP including flow on impacts in the catchment is estimated at \$100 million per annum (Figure 2), and employment at 500 FTEs directly on farm and 800 FTEs in the catchment (Figure 3).¹⁴

Hydro electricity generation is also a key part of the Catchment economy with a series of dams and canals constructed since the late 1960s. Catchment GDP is dominated by the hydro sector, although this is almost all direct GDP, with only relatively small flow-on impacts within the Catchment. The Catchment now has generation capacity for 8000 Gigawatt hours annually.¹⁵ The storage capacity means that only a small proportion of water is spilled (~6%) in large flood events. Revenue is estimated at \$660 million (\$85/MWh) and the system requires only a small operating cost base, mostly capital and fixed costs with small operating costs and workforce. Overall, hydroelectricity is the major component of catchment GDP (Figure 2). There have been two substantive proposals in recent years to develop generation on the Lower Waitaki, including Project Aqua and the North Bank Tunnel Project but neither has advanced past the planning stage.

¹¹ McCrostie Little et al., (1998).

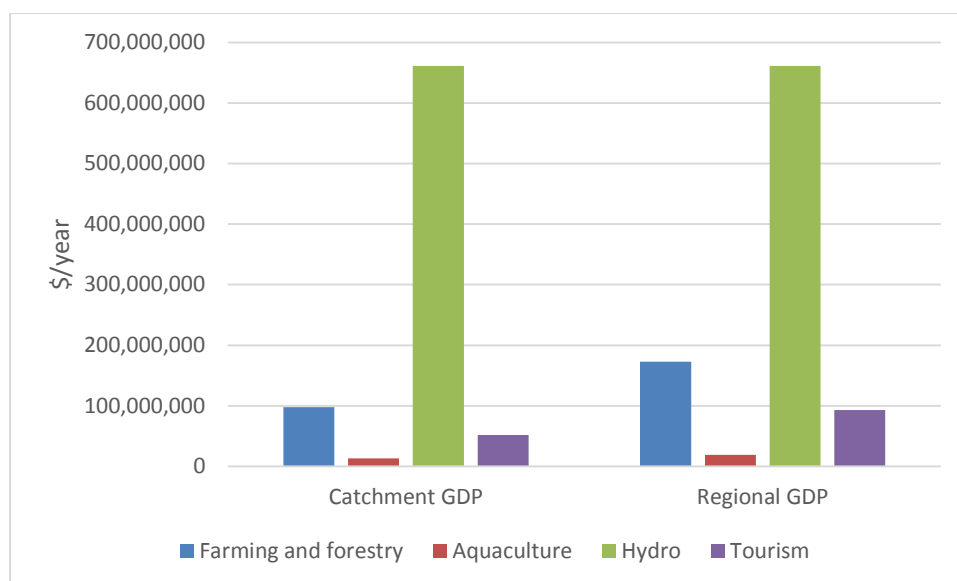
¹² http://en.wikipedia.org/wiki/Mackenzie_Basin,_New_Zealand 26 August 2013

¹³ Lough, R.S. (2009: 32).

¹⁴ The method for calculating economic impacts is described in Attachment 2.

¹⁵ 20-25 of national electricity production - <https://www.mfe.govt.nz/publications/water/waitaki-regional-plan-sep05/html/page3.html>

Figure 2: Catchment and Regional GDP upper Waitaki



Aquaculture is another significant primary industry that has recently emerged in the Mackenzie Basin, although it is currently a smaller part of the catchment economy relative to the other sectors investigated, with five sites that farm salmon. The three companies engaged in aquaculture produced 1,150 tons of chinook during the 2012 calendar year¹⁶, and reported they had 150 -200 employees in 2013. The salmon farms also attract large numbers of visitors who view the operations and purchase their fish products.¹⁷

Tourism is a further key component of the Catchment economy. While there is a long-standing tradition of summer holiday huts and camping around the Catchment's Lakes, tourism is still an emergent industry in the Catchment.¹⁸ Since the RLMP in the early 1990s¹⁹ a number of farm properties have added tourism enterprises to their agricultural activities to take advantage of the scenic beauty of the Upper Waitaki and their location on one of New Zealand's main tourist routes. Small businesses have also been established in the main settlements. There is a considerable amount of recreational activity on the Waitaki River, attracting both international and domestic visitors as described below.²⁰ Tourism development initiatives have included the upgraded Twizel town centre, other visitor facilities and the Alps to Ocean cycle trail (A2O).

Annual commercial guest nights through March 2014 were 487, 972 for Mackenzie District (92 percent of District beds in Catchment) and 370,442 for Waitaki District (35 percent of beds in catchment), giving an estimated 580,000 commercial guest nights in the catchment. It is estimated

¹⁶ The 2013 production year was significantly affected by the dewatering of the Tekapo-Pukaki canal for repairs.

¹⁷ Benmore Salmon, High Country Salmon, Mt Cook Alpine Salmon (pers comm., 2013). Note that these companies cite two sets of figures for employment – 100 (36 direct aquaculture + 64 direct processing & other) for chinook production of 1,150 tons and 150 for farm operation, hatchery, administration, management and processing.

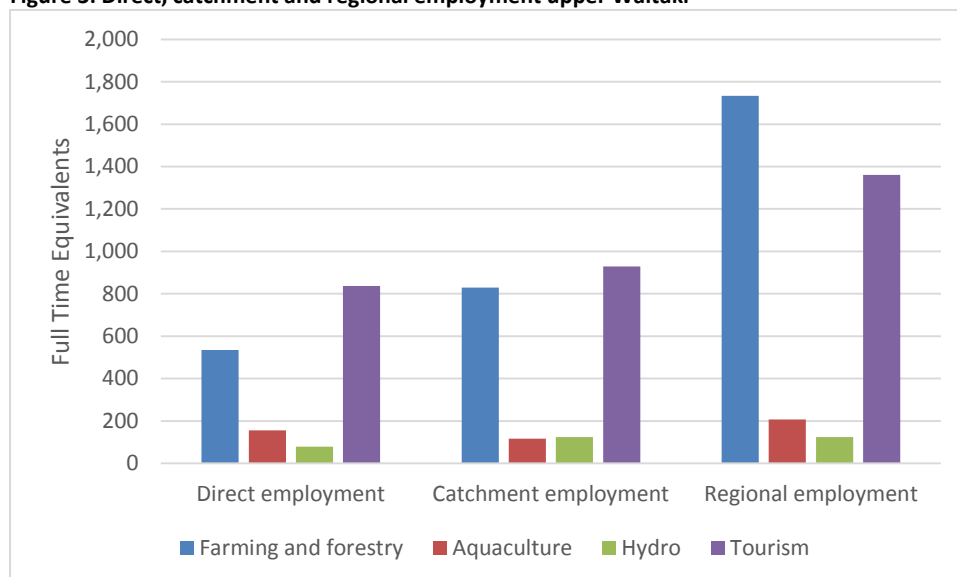
¹⁸ These issues are discussed in a series of reports by Taylor Baines and Associates which were part of the social and economic monitoring of the RLMP. Taylor Baines and Associates (1996); Taylor and Baines (1990).

¹⁹ The survey by Taylor Baines and Associates (1996) found that only a small number of farm properties had additional tourism enterprises and most were less than four years old.

²⁰ Visitor information is collected by the Waimate Information Centre, Oamaru's I-SITE Centre, and Kurow Community Information Centre.

that 34 percent of the bed nights within the Catchment were domestic visitors. Day visits are also very significant within the Catchment, with an estimated 330,000 domestic day visitors and 240,000 international day visitors in the Mackenzie District,²¹ the majority of which will be visits to the Catchment. Revenue associated with tourism within the Catchment is estimated at ~\$120 million including GST, and it is estimated that GDP associated with the tourism sector in the Catchment is \$50 million, with approximately 800 direct employees and flow on employment within the Catchment being approximately 900.

Figure 3: Direct, catchment and regional employment upper Waitaki



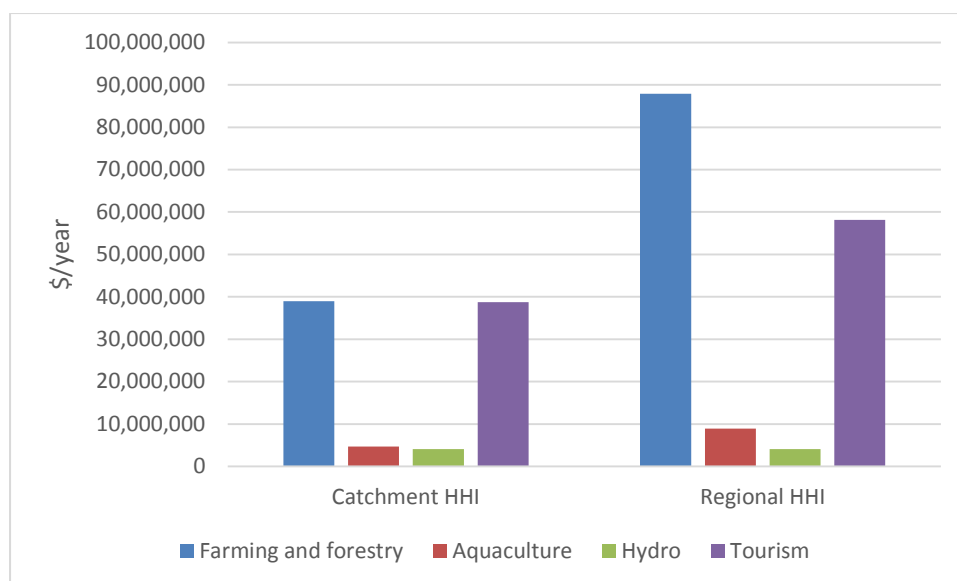
Tourism is a significant source of GDP, and in terms of employment is the largest source of direct and catchment-level employment with agriculture a close second. Electricity generation, despite its significant GDP contribution, is a small part of the employment profile, lower than aquaculture on an annual basis. It should be noted however that major projects in the Catchment, such as the recent upgrades to the Tekapo-Pukaki canal and the Benmore Power Station, resulted in significant numbers of workers in the Catchment.

Household income (Figure 4) closely follows employment, with agriculture and tourism being the major sources of household income, followed by aquaculture and hydro. The household income includes drawings and dividends to business owners as well as income received by employees.

It is interesting to note the relatively small flow on impacts within the Catchment across all sectors investigated. This effect was confirmed through interviewing with individual businesses, with most being linked more with the regional economy than they were with the local catchment economy. This is not a deliberate choice, but is driven by a lack of the required goods and services locally, particularly those which are cheaper to buy in bulk and are available in main centres, or those which are more specialised and therefore not able to be supported locally. In this respect the growth of Twizel from a hydro construction town to a rural service town is significant, with the range of goods and services increasing there over time, signified by the recent opening of a new, second supermarket.

²¹ Source: New Zealand Regional Tourism Forecasts 2010 – 2016. Tourism Strategy Group, Ministry of Economic Development, August 2010. Comparable figures are not available for the Waitaki RTO.

Figure 4: Catchment and regional household income for upper Waitaki



In terms of regional economic impact, hydro generation remains the most significant source of GDP, with agriculture and forestry (including processing impacts) the next most significant, and tourism third. There are potentially some modelling artefacts contributing to these outcomes, and they should be viewed with some caution. However they indicate that the primary sector is strongly intertwined into the regional economy with significant demand for goods and services from other parts of the economy. Aquaculture is shown as including greater employment at the direct and regional level than at the catchment level – this is the result of a modelling issue because the processing parts of the two major aquaculture operations, although part of the same entity, are located outside the Catchment but inside the region.

In terms of contribution to employment and household income, agriculture and tourism are the dominant elements of the communities, contributing significantly more than either the aquaculture and hydro sectors. This is not to discount the importance of the two latter sectors, but indicates that in terms of the local catchment economy they are not as significant a player.

The geographic linkages in the Catchment vary by location. Interviewing suggests that those businesses in the northern part of the Catchment tend to be more strongly linked to the Canterbury economy, while those in the southern and eastern parts of the catchment are more evenly divided, between Canterbury and Otago, sourcing goods from Christchurch, Timaru, Oamaru and Dunedin. This effect is reflected proportionately to the extent possible within the economic modelling, but it should be noted that the effects of development in the different parts of the Catchment are not able to be distinguished in the modelling process. For example, the regional impacts are estimated as equivalent regardless of where they occur in the Catchment.

In addition to examining the catchment economy, this profile also contains information about the three district economies: Mackenzie, Waikiki and Waimate, as discussed below.

2.1 Mackenzie District

Mackenzie District is the third least populated district in New Zealand.²² The District Council has its administrative centre at Fairlie, and a service agency at Twizel. The District has an area of 745,562 hectares and this includes the upper parts of the Catchment. Temperatures range between -10°C in winter to 35°C in summer. The District has experienced strong economic growth for the last five years. A report by Business and Economic Research Limited (BERL), notes that the District had the 8th fastest GDP growth of all territorial local authorities in 2012, and the 2nd fastest GDP growth of those authorities over the previous five years. The District employs 1,900 FTEs and generates \$190 million in GDP across 850 businesses. The primary sector has seen a shift from sheep to beef and dairy cattle, mainly in parts of the District outside the Catchment area. Activity in onshore aquaculture and associated processing, which is located in the Catchment, has also increased.²³ Tourism is a major feature of the upper Catchment (in the District) and the Mt Cook/Mackenzie Regional Tourism Organisation (RTO) provided 29 per cent of all regional employment (565 FTEs) in 2009, and contributed \$27 million of the region's GDP. The hospitality sector provided two-thirds of this regional employment - hotel accommodation (190 FTEs), cafes and restaurants (73 FTEs), motels and motor inns (67 FTEs) and caravan parks and camping grounds (42 FTEs).²⁴

The relatively small economy of Mackenzie District is based on hydroelectric generation, farming and tourism. The vast water resources of the upper Waitaki largely originate in the district and have enabled the development of hydro dams and canals, while Lake Tekapo and Mount Cook are important attractions for international tourists.²⁵ Significant changes in land uses over the last 10 years include increased numbers of accommodation providers, other tourism activities, holiday homes, and dairy farms.²⁶ There has been a surge in the development of residential and rural residential land outside the original zoning of Twizel, and lifestyle subdivisions have become established at Manuka Terrace near Lake Ohau.²⁷

The Agricultural Survey of 2012 identified the major farm types in Mackenzie District (n=267) as sheep (34%), sheep and beef cattle (18%) and beef cattle (15%). That year the District had 521,238 sheep, 42,387 beef cattle, 40,986 deer and 23,916 dairy cattle. By contrast there was little crop production on the District's farms, with only barley (7,733 tonnes) and oats (2,265 tonnes harvested) being of any significance.²⁸ Forestry makes only a minor contribution to the District's economy; with an estimated area of 4,888 hectares (4.4% of the Canterbury regional total) at 1 April 2012.²⁹

Visitors travel to Mackenzie District for its scenic beauty in the form of "wide open spaces, outstanding landscapes, rivers and lakes, mountains, high and low country"³⁰, and outdoor recreation activities such as skiing, boating, fishing, walking and cycling. Mount Cook National Park and the astronomical observatory at Mount John (near Tekapo)³¹ are popular destinations for international tourists. The Aoraki Mackenzie International Dark Sky Reserve is the first such reserve designated in New Zealand.

²² Mackenzie District Council (nd): 17.

²³ Leung-Wai, J. (2013):13

²⁴ Business and Economic Research Ltd (nd).

²⁵ Local Services Mapping (2009): 6

²⁶ Mackenzie District Council (nd): 43

²⁷ Mackenzie District Council (nd): 27

²⁸ Statistics New Zealand, farms-by-farm-type-ta -2012.xls, grain-seed-crops-ta-2012.xls, and sum-livestock-type-ta-2012.xls downloaded 30 April 2014.

²⁹ Ministry for Primary Industries (2012).

³⁰ Local Services Mapping (2009): 6.

³¹ Earth & Sky visitor numbers for night tours for Cowan's Observatory and the Mount John Observatory were 18,830 for the year ended 30 September 2013. These visitor numbers exclude people visiting Mount John Observatory during the day, and were provided by Earth and Sky to Ecan.

Three lakes in the Upper Waitaki are nationally important destinations for tourism, because of their scenic appeal.³² The iconic landscape, including the network of renowned 'turquoise' blue rivers, streams, lakes, hydro canals and lagoons, is an integral part of the nation's tourism product. Mount Cook National Park also features in the area's outstanding scenic value. Tourist appreciation of Lakes Ohau, Pukaki and Tekapo and other waterways mainly occurs at lookout points along State Highways 8, 83 and 80, the region's main 'viewing corridors'. Minor roads, and points on or near the shores of Lakes Tekapo and Ohau, and alongside the canals, also provide viewpoints for visitors.

Throughout the year water bodies in the District, especially Lake Ruataniwha, are used by organised recreational groups, community groups and schools for sports training, coaching, races and for more general public events that attract visitors from outside the region. Some of the better known events are the Four Lakes Tekapo Canal Road Race, the Meridian Aviemore Classic Yacht Race, the Maadi Cup Rowing regatta/secondary schools rowing and national rowing championships, and Run79 Lake Tekapo Mountain Bike Pursuit.

Accommodation statistics for Mackenzie District for the January and July months between 2001 and 2013 reveal that the number of guest nights for January increased by 29 per cent over the period, while those for July grew by 128 per cent. From the middle of 2011 until the early part of 2013, however, the number of guest nights in the District declined. This latter trend of a reduction in visitor numbers is confirmed by estimates of international visitors to Aoraki/Mount Cook National Park that recorded a fall from 186,600 in 2010 to 155,700 in 2012.³³

The effects of the global economic downturn on primary production and tourism numbers have suppressed activity in the construction sector of Mackenzie District over recent years. The value of building consents for the District compiled by the Department of Building and Housing decreased from \$27.4 million in 2007/08 to \$24.5 million in 2009/10. Data published by the Mackenzie District Council record that building consents granted fell from 256 in 2008/09 to 216 in 2010/11, while subdivision consents allowed decreased from 39 in 2008/09 to 18 in 2010/11.³⁴ The rateable capital value of the Mackenzie District was \$2,564 million at 1 July 2011; with the three hydro dams in the Pukaki Ward comprising 17 per cent of the district's rateable capital value.³⁵

The District Plan has zones for urban development near Lake Ohau Village, Twizel, Glentanner and Pukaki. Moreover, the Environment Court has provisionally approved three further rural-residential zones and a tourism zone in the Mackenzie Basin. They are:

- Manuka Terrace Rural residential zone (provisions and location as per the current District Plan)
- Ohau River rural-residential zone (780 hectares, with a maximum of 50 lots)
- Pukaki Downs rural residential zone (336 hectares, maximum of 49 lots)
- Pukaki Downs Tourist Zone (900 hectares situated on the western side of Lake Pukaki, with a proposal to limit the maximum occupation of the site to 300 visitor and staff beds within the zone).³⁶

³² Ministry of Tourism (2004).

³³ International Visitor Survey conducted by the Ministry of Business, Innovation and Employment. <http://www.med.govt.nz/sectors-industries/tourism/tourism-research-data/commercial-accommodation-monitor-data/cam-regional-pivot-tables-30-September-2013> Note: The data records both international and domestic visitors staying at accommodation establishments in the District.

³⁴ Mackenzie District Council (nd): 17.

³⁵ Mackenzie District Council (nd): 18.

³⁶ Toni Morrison, Mackenzie District Council (personal communication) and http://www.mackenzie.govt.nz/Site/Documents_and_policy/key_documents/district_plan.aspx

2.2 Waitaki District

The Waitaki District comprises the Ahuriri, Corriedale and Waihemo wards. It contains a large part of both the Upper and Lower parts of the Catchment. This area extends inland from the mouth of the Waitaki River, up the valley and through Ohau, to the top of the Ahuriri River valley. The economy of Waitaki District in 2010 employed 8,913 full-time equivalents (FTEs) in just under 3,000 businesses, and produced \$902 million in gross domestic product (GDP). It is mainly based on the manufacturing and primary sectors. The primary sector provided about a quarter of the district's employment and GDP in 2010, while manufacturing (mainly meat processing) contributed a fifth of total employment and a quarter of GDP. Other sectors, such as recreation, services, and construction, are relatively minor contributors to the economy).³⁷

Dairying and crop production, as well as the grazing of sheep and beef cattle, contribute significantly to the rural economy of Waitaki District, including the catchment areas. The main farm types in Waitaki District are sheep (25%), dairy cattle (16%), beef cattle (16%), and sheep/beef (10%). The District also produces substantial crops of wheat and barley.³⁸ Since 2001 several vineyards and wineries have established on the river flats and limestone hills east of Kurow.³⁹

Following irrigation of the lower Waitaki plains in the 1970s, dairy farming spread across the flats and more recently up the Valley towards Kurow.⁴⁰ This new form of farming attracted newcomers (farmers and farm workers) with different farming skills to the families whose dry-land properties they purchased. The leadership role of the families who chose to upgrade their existing production system to effectively use irrigation was crucial to validate the new land use and maintain a sense of stability in the community. Irrigation and the associated changes in land use has also demanded a wider set of skills from farm workers, farm contractors, rural service providers, builders and business people.⁴¹

Tourism is a key economic activity in Waitaki District that has had positive growth since 2000 (2.2% pa cf. 1.4% p.a. for the district's total employment). The Waitaki River is an important recreational resource, and the hydro lakes (Waitaki, Aviemore and Benmore), which also lie in part in Waimate District, provide a popular holiday area for campers during summer.

The main town of Oamaru is a tourism destination in its own right, with attractions such as the Victorian precinct and the Blue Penguin Colony. The majority of visitors to the Blue Penguin Colony stay overnight in Oamaru. Some interest groups in Oamaru are seeking to obtain world heritage status for the Victorian heritage precinct and a committee has been set up to manage the development of Harbourside. Visitors to Oamaru's I-SITE centre increased from 46,810 for the 2000/1 year to 77,881 for the 2005/6⁴² year and 96,211 in the 2009-10 year. Eighty-two per cent are international visitors, and 70 per cent are classified as free-independent travellers (FITs).

³⁷ Molana and Dixon, 2011: 5-6.

³⁸ Statistics New Zealand, farms-by-farm-type-ta -2012.xls, grain-seed-crops-ta-2012.xls, and sum-livestock-type-ta-2012.xls downloaded 30 April 2014.

³⁹ <http://www.nzwinedirectory.co.nz/wine-regions/south-island/waitaki-valley/>

⁴⁰ Development has recently spread onto 10,000 ha of the North Otago hill country south of the Catchment through the North Otago Irrigation Company, using Waitaki River water, bringing considerable economic benefit to the District (The Agribusiness Group, 2010).

⁴¹ McClintock *et al* (2002): 18.

⁴² Those viewing the Oamaru Blue Penguin Colony grew from 32,551 to 42,961 over the same period (Waitaki Development Board, 2006).

Oamaru also acts as a gateway to the Waitaki River and hydro lakes. The Waitaki River Valley and the lakes area have a number of scenic attractions and recreational resources that make them popular destinations for domestic and international tourists. The Valley is promoted as part of a tourism route to Queenstown with stops at places such as the Vanished World and Fossil Centre at Duntroun and attractions at Omarama. There is also a regional initiative to establish a new tourism route for Timaru-Oamaru-Tekapo-Christchurch, which would bypass Queenstown as a destination.

Economic diversification including recent viticulture has the potential to attract visitors, as reflected in the Taste Waitaki event held at Campbell Park in March 2006 and a range of publicity material. Visitor numbers are recorded by the Kurow Community Information Centre on State Highway 83. Between 2001 and 2004 (June/May year) the number of people visiting the centre increased from 4,982 to 5,460 per annum (Boffa Miskell, 2003: 25-26, Leisure Matters, 2004: 104). About 80 per cent of visitors to the Centre in 2001 and 2002 were local people from the area between Otekaieke and Otematata, and the remainder were from other parts of New Zealand or overseas (Boffa Miskell, 2003: 26). More recent data from the Information Centre shows an increase from 4,405 in 2005-6 to 9,598 in 2009-10. However, this large increase should be treated with caution as the visitor centre moved into the museum complex in 2008 making it a more accessible facility for visitors

2.3 Waimate District

Waimate District has six distinct environments with diverse forms of economic activity evident between them: the coastal strip, Hunter Hills, Arno/Waihao Forks/Waiohaorunga Basin, Western Hills, Hakataramea Valley, and the Waitaki River Valley.⁴³ Nearly all the farmland on the coastal strip is used for dairy and sheep production, and some horticulture. The Hunter Hills have planted forests for timber, as well as grazing land. The Arno/Waihao Forks/Waiohaorunga Basin is mostly well-developed farmland on hill country, while the Hakataramea Valley is a remote high country farming area with limited access and, with irrigation, some land use intensification to cropping and dairying in recent years.

Traditional land use in the Waimate District has undergone some major changes in recent years. In the District, for instance, dairying and berry fruit production have become significant contributors to the economy. Furthermore, the increase in dairy herds has been accompanied by the increased production of fodder crops.⁴⁴ The main farm types in Waimate District are sheep (23%), dairy cattle (23%) and beef cattle (20%).

Dairy production predominated in the Waitaki Valley from Ikawai eastwards across the North Fan to the coast after the same process of conversion to dairying took place as experienced on the southern plains. Dairying has also recently spread upstream from Ikawai to Hakataramea on the Waikiki Valley North Bank in recent years.

Farming interests in the Waimate District view further irrigation as a means of intensifying present production methods as well as providing opportunities for the development of new primary activities. The Hunter Downs Irrigation Scheme has consents to take water from the Waitaki River to irrigate 40,000 hectares of land in Waimate and Timaru Districts. Widespread introduction of irrigation in the Lower Waitaki and the surrounding plains and down lands has already brought about significant changes in land use and employment in the district over the past 30 years.

⁴³ Note, for the purposes of catchment planning ECAN has termed areas on both sides of the river including areas above Stone Wall as Waitaki Valley and Tributaries as a sub-catchment area. This area includes the river flats commonly called North Bank. South of Stone Wall ECAN has called the river flats and their tributaries and groundwater areas the North Fan (see map 2).

⁴⁴ Aoraki Development Trust (nd): 4

The visitor sector is a modest part of the Waimate economy. Visitor information recorded by the Waimate Information Centre for the 2002 to 2005 years is summarised in Table 1. The total number of visitors grew from 6,550 to 8,290 over this period. Forty-six per cent of visitors were from Waimate District, 38 per cent from other parts of New Zealand and 16 per cent from overseas. Furthermore, a visitor survey for the Waimate District found that 26 (37 per cent) of the 70 people interviewed were international tourists; mainly from the United Kingdom, North America, Australia and Europe. Visitors were usually day trippers, and the most popular activities were walking and sightseeing (Waimate Information Centre, 2006).

Table 1: Visitors to Waimate Information Centre 2002-2005

Year	Local	South Island	North Island	International	Total
2002	2,883	1,985	657	1,025	6,550
2003	4,180	2,453	673	1,242	8,548
2004	4,362	2,814	669	1,567	9,412
2005	3,725	2,658	553	1,351	8,287
TOTAL	15,150	9,910	2,552	5,185	32,797

Source: Waimate Information Centre

In terms of employment, tourism is ranked fifth among local industries, and its three main sub sectors are cafes and restaurants, hotel accommodation, and other types of accommodation. The education sector, by contrast, is less robust; with negative growth over the last ten years (-1.3% pa). Primary and secondary education experienced a decline in employment, and while preschool is higher and other educational types have had increases in FTEs over this period, their magnitude was insufficient to reverse the overall trend (see discussion of school rolls below).⁴⁵

3 Population and communities

3.1 Overview of communities and population change

Residents of the rural areas of the Waitaki Catchment have a dispersed pattern of settlement founded on the historical allocation of sheep stations and their homesteads. Access to and around the Catchment is through Burkes Pass in the north and the Lindis Pass in the south, or from the east via the Waitaki Valley on State Highway 83. The main settlements are on these highways. Most of the Catchment lies in the Canterbury Region, although the area south of the Ohau and Waitaki Rivers is located in Otago, and provincial affiliations remain an important factor in the social identities of the Catchment.

The rural communities of the Waitaki have experienced considerable change since the 1980s arising from fluctuations in fine-wool prices; droughts; the management of weeds, pests and soil conservation (including land tenure reform)⁴⁶; the withdrawal of state funded farm subsidies and advisory services; and development of the dairy sector. Despite some economic diversification, communities in the Catchment lost population during the 1990s, but this trend was reversed with a period of growth between 2001 and 2006, mostly due to subdivision in and around the main townships and growth in the rural areas.

⁴⁵ Molana and Dixon (2011): 26-28.

⁴⁶ Farmers saw the reform initiated in the 1990s, resulting in freehold tenure in place of Crown pastoral leases over larger areas including potential conservation land, as the means to open up economic development (Morris, et al., 1997).

Table 2 illustrates the uneven population changes in recent years at the community level and low growth at the district level. The two rural areas of Upper and Lower Waitaki (see maps) experienced much stronger population growth than their respective districts between 2001 and 2013. By comparison population growth in the townships has been mixed. Only Lake Tekapo, Twizel and Glenavy increased their populations during this period, while in Mount Cook, Omarama,⁴⁷ Otematata, Kurow and Duntroon the number of residents declined over the 12 years shown. In the shorter timeframe 2006-13 the population of Omarama grew.⁴⁸

Table 2: Changes in usually resident population of selected areas of Upper Waitaki 2001-2013

Area	2001	2006	2013	Per cent change 2001-2013
Rural Upper Waitaki	447	576	642	43.6
Mount Cook	234	213	195	-16.7
Lake Tekapo	303	318	366	20.8
Twizel	1011	1017	1137	12.5
Omarama	276	231	267	-3.3
Otematata	243	186	186	-23.5
Rural Lower Waitaki	1152	1251	1497	29.9
Kurow	387	339	312	-19.6
Duntroon	117	114	87	-25.6
Glenavy	189	195	267	36.9
Mackenzie District	3717	3804	4158	11.9
Waimate District	7101	7209	7536	6.1
Waitaki District	20085	20223	20826	3.7
New Zealand	3737277	4027947	4242048	13.5

Source: Statistics New Zealand

Statistics NZ forecast that Mackenzie District's population in 2031 could range from 3,660 (low) through 4,230 (medium) to 4,800 (high) Waimate District from 6, 550 (low) through 7,660 (medium) to 8,800 (high), and Waitaki District from 17,950 (low) through 20,800 (medium) to 23,700 (high). 49

Further details of the population of the catchment from the 2013 census are in a separate, supplementary document "Demographic profile of the Waitaki Catchment".

3.2 Lake Tekapo and Mt Cook

Mount Cook Village is located within Aoraki/Mount Cook National Park. The visitor centre of the National Park, and tourism enterprises providing scenic flights, 4WD safaris, horse treks, boating, and fishing operate in the village.⁵⁰ The Hermitage, an international class hotel, motels, backpacker hostels and a small camping ground provide accommodation for visitors. The usually resident population of the village in 2013 was 195; a decline of 18 per cent from 237 in 2006. Some workers at Mt Cook reside in and commute from Twizel.

Lake Tekapo, a township on the southern shore of the lake of the same name, is 106 kilometres north-west of Timaru on State Highway 8. It is a major service stop on the popular tourist route to Mount Cook and Queenstown, with many buses passing through the township every day. The

⁴⁷ Note Omarama grew slightly 2006-2013 and Otematata stayed stable.

⁴⁸ Participants in a community workshop attributed the change around to new business activity in the area.

⁴⁹ Statistics New Zealand, Subnational population projections, 2006(base) -2 031, updated 2012, Table 2.

⁵⁰ http://en.wikipedia.org/wiki/Mount_Cook_Village 4 October 2013

Mount John observatory, a bird sanctuary, and a military camp are located near the township. The Roundhill skifield is on the eastern side of the lake, and the Lake Tekapo Regional Park, administered by Environment Canterbury, is on the southern side.

Before the construction of the Upper Waitaki Power Scheme began in 1940, the settlement at Lake Tekapo comprised two station homesteads, a private hotel, and several holiday cottages. Within a short period of time this small hamlet was transformed, as the Ministry of Works built several camps for construction workers and staff, and established offices and other facilities in the township.⁵¹ After the project was completed in the 1950s, however, Lake Tekapo reverted to a small settlement.

Visitors to the district around Lake Tekapo increased during the early 1960s; particularly ice-skaters and skiers during the winter.⁵² Since then other recreational activities, such as fishing, boating and hunting, have also enticed growing numbers of domestic holiday makers and international tourists to the MacKenzie Basin.⁵³ The township now has a wide range of food outlets, activities and accommodation available for visitors including hotels, apartments, motels, holiday homes, bed and breakfast providers, camping ground and hostels. New subdivisions are in the process of development. The Church of the Good Shepherd and bronze sheepdog attract day visitors travelling by bus or car through the area. The Mt John Observatory and nearby café is a focal point for the International Dark Sky Reserve and the recently developed Tekapo Springs at the foot of the mountain boasts a day spa, hot pools, ice rink, tube park and café.

After a decade of population decline between 1981 and 1991, when the number of residents fell to 189, there was a period of rapid growth during the early 1990s. By 1996 the usually resident population had increased to 294. Since then the growth rate has moderated, and the township's population has become relatively older. The usually resident population of Lake Tekapo grew by 22 per cent from 303 in 2001 to 369 in 2013.

3.3 Twizel

The Twizel Community is situated on State Highway 8 about 150 kilometres inland from Timaru and Oamaru. The land on which the township is sited was part of the Ruataniwha Station purchased by the Government in 1965.⁵⁴ Built on a green field site to provide housing for construction workers on the Upper Waitaki Power Scheme for 15 years, Twizel now functions as a rural service centre and a holiday resort for visitors to the Mount Cook region.⁵⁵ It is on the route of the Alps to Ocean (Alps2Ocean) Cycle Trail.

Land development started at the new settlement of Twizel in September 1968. In three years the population of Twizel had grown to 3,300, finally reaching 6,000 during the peak hydro-construction period of 1976-77. At that time there were 1,224 family homes in the town, with the majority (1,129) owned by the Ministry of Works, as well as accommodation for single workers. There were also 12 shops, schools, and a post office in the town centre.⁵⁶ When construction activity on the Upper Waitaki Power Scheme wound down between 1981 and 1986, many houses in Twizel were relocated to other rural towns, and some construction workers and their families moved to Cromwell where they helped build the Clyde Dam.⁵⁷

⁵¹ Maxwell (1990): 2, 4.

⁵² Maxwell (1990): 22.

⁵³ McClintock (1999): 64

⁵⁴ Sheridan (1995): 104.

⁵⁵ McClintock (1999): 21.

⁵⁶ Bendien (1983): 10-13.

⁵⁷ Taylor & Bettesworth (1983): 52. Furthermore, this study shows that some Twizel workers had moved originally from Otematata and construction of the Benmore dam.

Many community organisations and local services ceased operating after the rapid decline in the town's population, and the remainder reduced their activities. Retired people and beneficiaries moved to Twizel in the late 1980's attracted by cheap housing and excellent community amenities.⁵⁸

Twizel provides a convenient base for visitors to the skifields and lakes in the district. Campers, fishers, boating enthusiasts and skiers take advantage of the accommodation and other tourism services available in the town. The accommodation providers include a country inn, several motels, backpackers and two holiday parks.⁵⁹ The introduction of salmon farming and dairying in the Mackenzie Basin, and revamped town centre, new supermarket and cafes, and the presence of trades people, has changed Twizel's role in the local economy. There were 1,137 residents⁶⁰ in 2013, about four per cent lower than the peak population of the post hydro construction era of 1,179 that was recorded by the censuses of 1986 and 1996. Although the permanent population of Twizel has been around 1,100 since 1986, there may be more than three times that population in the town during the summer and, as shown in Table 1, the population grew 12.5 per cent over the last 12 years.⁶¹ Half of the 1,100 properties in Twizel are owned by non-residents.

3.4 Omarama

Omarama is located in the Upper Waitaki Valley on the edge of the Mackenzie Basin at the junction of State Highways 8 and 83. The township is 30 kilometres south-west of Twizel by road, and there is an aerodrome nearby that hosts gliding events. The first Europeans who settled the district around Omarama were the run holders⁶² and their employees at the Omarama and Benmore Stations.⁶³ Their successors, and other run holders in the Mackenzie Basin and Waitaki Valley, developed the merino wool industry during the 20th century.

In the 1960s and 1970s there was an intensive period of construction on the Upper Waitaki Power Scheme that boosted Omarama. Nowadays part of the workforce responsible for maintenance of the electricity generating facilities is based at Omarama, but some of these have moved to Twizel in recent years. The tourism industry is an important contributor to the economy of the area, and for the township of Omarama in particular. Domestic tourists are attracted by the lakes of the Waitaki Valley, while international visitors traverse the north-to-south route via the Mackenzie Basin to Omarama and Central Otago.⁶⁴ The area around Omarama is a world-class gliding venue, and has many rivers and lakes suitable for recreational fishing.⁶⁵ Omarama has several businesses providing accommodation for these visitors including two hotels, three motels, a back packer's hostel and two holiday parks.

Omarama's population fell by 30 per cent from 382 to 267 between 1976 and 2013. After an initial period of decline during the latter part of the 1970s, the population of the township rebounded to 384 in 1991. Since then the number of residents in Omarama has gradually declined to 231 in 2006, before growing again by 16 per cent over the last seven years.

⁵⁸ Fitzgerald & Taylor (2000): 6.

⁵⁹ The volume of visitors has a distinct seasonal pattern. The average numbers of visitors per day to the Twizel Information Centre for 52 weeks ended March 2013 indicate that the volume of visitors is highest in January to February when they range between 170 and 250. Numbers begin to decline in March when they fall to 20-40 visitors until October. Then they gradually increase again. Source: Twizel Information Centre.

⁶⁰ Note the census night count was 1,509 indicating there were 372 visitors in town who completed census forms on 5 March 2013.

⁶¹ <http://www.twizelnz.com/about-twizel-nz.html> 4 October 2013

⁶² Run is a common term for large farming properties based on Crown pastoral leases.

⁶³ Aubrey (1978): 22, 29.

⁶⁴ Taylor Baines & Associates (1997).

⁶⁵ <http://en.wikipedia.org/wiki/Omarama> 4 October 2013

3.5 Otematata

Otematata is a small settlement near Lake Aviemore in the Waitaki Valley. It is 96 kilometres north-west of Oamaru on State Highway 83. The construction of the dam at Benmore began in 1956, and a temporary hydro town at Otematata was established seven kilometres from the site of the dam. The amenities of the township included sewerage, water supply, sealed roads, educational and medical facilities, a community centre, a shopping centre, a post office and a cinema.⁶⁶

The Benmore project reached its employment peak in April 1964 with a workforce of 1,566. The population of Otematata was 4,280 at that time, and there were over 80 organisations and clubs in the township. By 1968, however, the project's workforce had declined to 500.⁶⁷ After October 1971 the Waitaki County Council took over responsibility from the Ministry of Works for community services and maintenance work in Otematata. There was high demand from the public for the vacant houses and they were quickly sold. Many hydro workers employed elsewhere in the district continued to reside in the township after the completion of the Benmore Dam. Residents of Otematata in 1974 included bach⁶⁸ owners, retired people, staff of the New Zealand Electricity Department, and contract workers.⁶⁹ The township had shrunk to 320 dwellings and 50 vacant sections in October 1975, whereas four years before there had been 1,100 houses.⁷⁰ Employment remains the main motivation for residents to live in Otematata whereas the natural environment, lakes and recreation opportunities attract holiday home owners.⁷¹

In the aftermath of hydro construction the population of Otematata decreased from 692 to 186 (73 per cent) between 1976 and 2013. Apart from a brief period of growth between 1986-1991 when the number of residents increased by 8 per cent, the population of the township has continued a decline that commenced with the departure of construction workers and their families about 50 years ago. As the usually resident population has declined its composition has changed with an increasing proportion of elderly residents and Maori (from 3.7 per cent in 2001 to 7.9 per cent in 2013).

The district surrounding Otematata has become a popular holiday destination during summer for domestic visitors attracted to the Waitaki Valley and Lake Benmore for fishing, boating, camping and other recreational activities. The township has a holiday park, cottages and hotel that provide accommodation for domestic and international visitors. Otematata Station, a run of 40,000 hectares, has 30,000 merino sheep and 400 Hereford cattle, and diversified its business by providing walking, cycling, horse riding and accommodation for tourists.⁷² The Alps 2 Ocean bike trail is promoted locally as a means to stimulate economic growth and community views support this objective, although there are concerns the trail could end up bypassing the village. On the other hand, are concerns the peaceful nature of the village could be disrupted by more visitors.⁷³

3.6 Kurow

Kurow, a township on the southern bank of the Waitaki River, is four kilometres downstream of Lake Waitaki. The township has a strong historical association with hydro-electricity construction, beginning with the construction of the Waitaki dam from 1928-34. At one stage there was a construction workforce camp of over 2000 people on the north side of the river, and the project

⁶⁶ Taylor & Bettesworth (1983): 49-50.

⁶⁷ Sheridan (1995): 7.

⁶⁸ Holiday home

⁶⁹ Taylor & Bettesworth (1983): 112-114.

⁷⁰ Taylor & Bettesworth (1983): 50.

⁷¹ Otematata Resident and Holiday Home Owner Survey by Jude Wilson and Mike Mackay, Lincoln University.

⁷² <http://www.otematatastation.co.nz/> 4 October 2013

⁷³ Mackay et al. (2014).

made considerable use of the services available in the township.⁷⁴ In the last 15 years there has been two major proposals for hydro development on the lower river: Project Aqua and North Bank Tunnel. While investigations have added to the local economy, both projects have fallen flat in the planning stages, after causing considerable social disruption.

Kurow is the rural service centre for the Waitaki Valley. Its commercial activities include a grocery store, farm services, hardware supplier, a garage, two hotels, a motor camp, motel, cafes and several retailers serving the needs of tourists and other visitors. Other services available in the township include a recently modernised primary school, an information centre/museum, library, gallery/craft shop, winery shop, police station, fire station, ambulance, medical centre, a home for the elderly, and a veterinary clinic.⁷⁵ The medical centre at Kurow has a doctor and two nurses, while the ambulance service is provided by volunteers. Opposite Kurow on the northern side of the river is the small settlement of Hakatamea and the associated valley. While it is on the north side of the river the Valley has traditionally been part of the Kurow community, as well as associating with Waimate District.

3.7 Lower Waitaki

The Rural Lower Waitaki comprises the rural catchment areas extending on the northern side from Lake Aviemore to the coast and on the southern side from Lake Aviemore to below the Black Point area, where the Otago regional boundary cuts north to the river (Map 2). As noted above, the Lower Waitaki includes three areas defined as sub catchments including the Hakatamea Valley, the Waitaki Valley and Tributaries, and the North Fan.

Agricultural production is largely livestock farming on a mix of fertile, river terraces and hill country. Much of the river terrace land is irrigated from surface and ground water sources. The advent of irrigation in the 1970's transformed land use and farming systems on the both sides of the river. Dairying gradually replaced dryland sheep farming, and the rotation and work routine of incoming dairy families and farm workers changed the nature of community life in the area over time. The number of operational farm units has decreased along with the number of "farm" families, while the number of farm workers has increased. The increase in farm workers is matched by an increase in housing units for farm workers. Many of these workers are from overseas, as found elsewhere in Canterbury, bringing challenges⁷⁶ for schools, housing and labour management. The initial outcome was a distinct social divide between traditional farming families and dairy families,⁷⁷ but now that dairying is the predominant farming system the community the divide may be less prominent while the community is less cohesive due to the annual churn of dairy farm workers.

In the Hakatamea Valley dryland farming predominates with major constraints being wind erosion and periodic drought. Land uses include arable farming, mixed sheep and beef and some deer. The area under irrigation is increasing to over 3000 Ha based on newly consented takes from the Waitaki River and ground water. At this point there is a limited area of dairy support in the Valley, however the area of dairy support is under further development with the new irrigation.

The Hakatamea Valley has experienced considerable social change over recent years but a close-knit community continues.⁷⁸ The Cattle Creek and Hakatamea Schools have closed and

⁷⁴ Natusch (1984).

⁷⁵ Boffa Miskell (2003): 24-25.

⁷⁶ There is a concerted effort to meet these challenges and help newcomers and communities adjust through a collaborative approach as outlined in "Settling in Aoraki: Migrant Community Services, Report".

⁷⁷ McCrostie Little *et al* (1998): 5-6, 17-18

⁷⁸ Evidence of RW Sutton to ECAN on 35 applications to take and use groundwater from the Waitaki River Catchment.

amalgamated with Waitaki Valley School in Kurow. An express school bus runs to Cattle Creek, with parents providing transport from there. The church has closed and the hotel recently closed, leaving little in the way of community facilities, apart from the Cattle Creek hall and the Waitaki Rod and Gun Club, where a mobile kindergarten has operated. Social changes in the Valley in the last ten years have included several farms where managers have replaced owner operators, bringing some younger families into the Valley. At a catchment workshop one farmer pointed out that meetings were one of the few occasions people met as a community!

Duntroon, is a village on State Highway 83, 44 kilometres east of Kurow on the southern side of the Waitaki River. It has several businesses which provide for the needs of residents and visitors, and a few facilities including a primary school, a hotel, a garage and a domain (public park).⁷⁹

There is a small cluster of buildings at Ikawai on the northern side of the river; including a community hall, and an old primary school that was run as a café for a while, closing in 1997.

Glenavy is a small settlement on the north bank of the Waitaki River 20 kilometres north of Oamaru on State Highway 1. It has a fishing reserve near the mouth of the Waitaki River which has a number of huts and is regularly visited by anglers. Glenavy has a domain, hall and hotel which provide venues for sporting and social events, and contribute to a sense of community for residents.⁸⁰ A new dairy processing factory is under construction near the village and its presence and substantial workforce is likely to have an impact on the area.

3.8 School rolls

School rolls are an indicator of population trends and social vitality at the community level. Rural schools have large catchments that are defined by their enrolment zones and bus runs. Trends in the Catchment school rolls are provided in Table 3. Overall, school rolls have declined, however places with a growing population have increased their rolls since 2004. Twizel, Glenavy and Papakaio all have increasing rolls. However, just because a population is increasing does not mean that a school roll will necessarily rise, as evidenced by Lake Tekapo. Clearly for a roll to increase young families are needed. Furthermore, the roll numbers are taken by the Ministry of Education at the end of June (count date 1 July) each year. While a consistent point in the year is important to identify trends over time, a single point does not show the variation in any one year that small rural schools typically experience, as noted in discussions with schools in developing this profile.

⁷⁹ Boffa Miskell (2003): 25.

⁸⁰ Wilson (1999): 268, 270.

Table 3: School Rolls Upper and Lower Waitaki 2005-2013

	2005	2006	2007	2008	2009	2010	2011	2012	2013	Change in roll 2005-2013
Aoraki Mount Cook	13	13	13	15	15	12	7	8	10	-3
Lake Tekapo	25	20	22	21	12	17	18	20	21	-4
Twizel Area	150	143	155	165	175	185	183	186	187	37
Omarama	45	40	34	34	35	28	23	38	33	-12
Waitaki Valley	113	105	102	105	90	92	96	105	105	-8
Duntroon	71	66	61	67	67	62	75	75	61	-10
Papakaio	91	103	106	103	104	101	102	118	120	29
Morven	31	23	21	17	14	17	32	28	29	-2
Glenavy	51	46	62	73	86	85	94	80	74	23
Total Mackenzie/ Waitaki/ Waimate Districts	5527	5385	5294	5283	5170	5145	5147	5133	5184	-343

Closed Schools: Waihaorunga School (Waimate District) 2009, Otepopo School (Herbert in Waitaki District) 2010. Note that before 2005 a number of small schools were closed and amalgamated with other schools, boosting the rolls in Waitaki Valley School, Papakaio and Glenavy.

3.9 Social issues

Participants at a 2009 community workshop at Twizel recognised a number of issues and gaps in services faced by residents of the Mackenzie District. The issues were the viability of some services (including those dealing with emergencies), a lack of accessibility and coordination of health services, and a growing interest of members of the community in the concept of lifelong learning. The gaps identified were community and residential care for older people, music and arts tutoring for children and young people, specialist sports coaching for young people, primary and specialist health, dental health, and drug and alcohol services.⁸¹

Another community workshop, held at Waimate in 2009, identified a number of issues and gaps in services faced by residents of the Waimate District. The issues included an aging population; the arrival of new families associated with large dairying ventures and innovative industries; the need to travel to larger settlements for services; and the shortage of volunteers for community organisations and clubs. Participants noted gaps in the community care for older people; primary health⁸² and specialist facilities; drug and alcohol services; and parenting and budgeting advice.⁸³

Waikiki District has a strong base of social capital.⁸⁴ Many of the available organisations and services are based in Oamaru but there is also a number located within the Waitaki Valley, particularly at Duntroon and Kurow (Boffa Miskell, 2003: 28). A key issue identified during community discussions is the need to maintain the base of volunteers for activities such as the volunteer fire brigades.

⁸¹ Local Services Mapping (2009): 83.

⁸² Marwick and Esplin (2009: 6) also reported community concerns about the availability and continuity of general practice care,

⁸³ Local Services Mapping (2009): 82.

⁸⁴ There are around 450 organisations in the district including social service and health providers, pre-school educators, community groups, churches, sports clubs and other recreational clubs (North Otago Citizens Advice Bureau, 2010).

3.10 Stock, drinking and wastewater

The Upper Waitaki Catchment is under the jurisdiction of two local territorial authorities. The Mackenzie District Council administers the northern part, and the Waitaki District Council the southern part of the region.

The Mackenzie District Council has five public water supplies: a rural scheme at Allandale and four urban schemes, at Fairlie, Burkes Pass, Tekapo and Twizel.⁸⁵ The District has three public systems of stock water races (Ashwick Opuha, School Road and Puneroa Eversley). Many rural households obtain water from private community schemes, individual bores and surface water takes.⁸⁶ The urban scheme at Tekapo was established during the 1950s to supply water for workers and their families who arrived in the area to construct the hydro-electric power scheme. A small treatment plant provides drinking water for residents and tourists by chlorinating water abstracted from Forks Stream.⁸⁷ Likewise the scheme at Twizel was developed in the 1970s to service construction of the hydro-electric power scheme, and has since been extended to the west of the town to supply water for further residential development. It abstracts water from three wells located on the south bank of the Fraser Stream.⁸⁸ This water was untreated until 2011, when a sodium hypochlorite dosing system was installed to disinfect the supply until the existing scheme is replaced or upgraded.⁸⁹

Tekapo has had wastewater reticulation since the 1950s. The treatment plant was commissioned in 1972, and upgraded thirty years later by the addition of two oxidation ponds, three maturation ponds, the installation of a new pump station, and a rebuild of the existing pump station. Storm water has infiltrated the sewer system on occasions, and could potentially overload the system.⁹⁰ Twizel's sewer network was constructed in the 1970s with asbestos cement pipe. The Council plans to construct rapid infiltration basins on land adjacent to the existing oxidation ponds.⁹¹

The Waitaki District Council operates 23 water supplies. They comprise a medium size urban scheme at Oamaru, five smaller urban schemes at Palmerston, Kurow, Otematata, Omarama and Lake Ohau, 17 rural restricted water supplies (some of which are to be amalgamated) and an open water race. All of them are managed by a mixture of Council organisation or Council scheme committees.⁹² The rural schemes have small diameter pipes supplying water on a continuous basis for livestock and domestic use, and do not provide any firefighting capabilities, while the urban schemes at Lake Ohau, Omarama and Otematata provide an "on demand" service for domestic and business consumers.⁹³

Otematata, Omarama, and Lake Ohau have wastewater systems, operated by the Waitaki District Council, that collect, treat and dispose liquid waste to acceptable environmental standards. It is expected that the Omarama Treatment Plant will require upgrading by 2015; projected population

⁸⁵ It has a formal agreement allowing the Albury Rural Water Supply Society to manage the Albury water supply, and also permits consumers to manage the small piped stock water scheme of Kimball Rural.

⁸⁶ Mackenzie District Council (nd: 57).

⁸⁷ Opus International Consultants Ltd (2011a: 3).

⁸⁸ Opus International Consultants Ltd (2011b: 3). A ultra violet treatment system was expected to be installed during 2012 (Mackenzie District Council nd: 59).

⁸⁹ Mackenzie District Council (nd: 59).

⁹⁰ Mackenzie District Council (nd: 69).

⁹¹ Mackenzie District Council (nd: 70-71).

⁹² Waugh Infrastructure Management Ltd (2012: 32).

⁹³ Waugh Infrastructure Management Ltd (2012: 37, 67).

growth of the township may increase the corresponding wastewater load to a point where its discharge to the Omarama Stream could have an adverse effect on the environment.⁹⁴

Duntroon has a water treatment plant that the Waitaki District Council plans to upgrade during the 2013/14 year to comply with the drinking water standards for New Zealand. The township also has a wastewater system to treat and dispose of liquid waste.⁹⁵

Glenavy is part of the Lower Waihao-Waikakahi water supply scheme operated by the Waimate District Council. The water for this scheme is obtained from two wells near the Waitaki River and pumped 4.5 kilometres to a reservoir. It is disinfected by injecting chlorine gas into the delivery main.⁹⁶

4 Outdoor recreation

4.1 Recreation in the Upper Waitaki

The Upper Waitaki Catchment has four potential water bodies of national importance for recreation - the Ahuriri River, and Lakes Aviemore, Benmore and Tekapo.⁹⁷ They are a significant recreational resource for local residents, domestic holiday makers and international tourists.

Water-based recreational activities in the Catchment are very important; particularly during the spring, summer and autumn months and include a mixture of contact water-based recreational pursuits and shoreline activities.

The main contact water-based recreation activities in the Upper Catchment are trout and salmon fishing, swimming, motorised boating and non-motorised boating. The predominant shoreline recreation activities are walking and hiking, camping, picnicking, mountain biking, general sightseeing, organised community events, four wheel driving, and wildlife and nature viewing. Further information is available in the recreation survey results available in support of this profile.

Fishing

Recreational fishing on the water's edge and from boats occurs throughout the Upper Waitaki Catchment. It is the most widely dispersed water-based recreation activity in the area, with 38 well known sites identified for trout fishing, and six for salmon angling. Brown and rainbow trout are abundant throughout the Catchment and comprise most of the recreational catch. The Inventory of Recreation Values for Rivers and Lakes of Canterbury New Zealand (ECAN, 2004) identifies Lakes Alexandrina and McGregor as salmon fishing areas of 'high' frequency and intensity of use, and the middle and lower reaches of the Ahuriri River, Lake Alexandrina, Lake Aviemore, Lake Benmore, Lake McGregor, Lake Poaka, and the Tekapo and Twizel Rivers as intensively and/or frequently fished areas for trout.

Boating

Water bodies in the Upper Waitaki Catchment, particularly the area's main lakes, are very popular for power boating, jet boating, water skiing and jet skiing, yachting, canoeing, kayaking and rowing. In many cases, these activities share the same water resource, such as at Lake Ruataniwha where a

⁹⁴ Waitaki District Council (nd: 71-74).

⁹⁵ Waitaki District Council (nd): 71, 87.

⁹⁶ Waimate District Council (2012): 181.

⁹⁷ Ministry of Environment (2004). The report was from a programme aimed at recognising the broad values associated with New Zealand fresh waterways and lakes, and national water bodies that potentially require protection or specific management strategies.

world-standard rowing course coexists with a Formula One Class boating area. Launching facilities and 4WD access tracks provide recreational boaters with good access to the main water bodies throughout the upper catchment. The recreational use of motorised boats is mainly concentrated on the main lakes, while the use of non-motorised boats on both rivers and lakes is wide-spread across the Upper Catchment.

Swimming

Swimming occurs in many lakes and rivers of the Upper Waitaki. The Inventory of Recreation Values for Rivers and Lakes of Canterbury New Zealand categorises Lakes Aviemore, Benmore, Middleton and Ohau as freshwater bodies that attract 'high' numbers of swimmers. Other popular swimming sites this inventory identifies are the Fraser River, Kellands Ponds, Lake Poaka, Loch Cameron, Twin Lakes, Lake Wardell, Lake McGregor and the 'Lagoon' at Lake Ruataniwha.

Walking/Hiking

There are numerous places where people engage in informal walks in the Upper Waitaki Catchment. Based on a survey of the recreation literature, walking is perhaps the most widely dispersed shoreline recreation activity; with 24 different walking tracks and trails identified. The Tekapo walkway has at least 10,000 visitors per year and is the most popular walk in the Upper Catchment.⁹⁸ Other distinguished walking and hiking tracks in the Catchment include: Canyon Creek, Deep Stream Walk, Freehold Creek Day Tramp, Red Hut Walk, the Lake Alexandrina Walks, the Lake Benmore Peninsula Walk, Pukaki Kettle Lake Walk, the Lake, Pines Beach and Cowan Hill Circuit, Lake George Scott Circuit, and the Temple View Walk.

Mountain Biking

The network of 4WD tracks, metal roads and walking trails that are alongside and/or link water bodies in the Catchment are also routes for recreational mountain biking.⁹⁹ Popular mountain bike locations include the Godley Glacier trail, the Lake Ohau Loop, the Hakataramea Valley¹⁰⁰, the Hopkins River Valley¹⁰¹, and the Ahuriri, Hopkins, Ben Ohau and McCauley areas.¹⁰² The Alps to Ocean trail is under construction as part of the national cycle trail and seen by local operators as a key long-term initiative.

Wildlife Viewing

The Upper Waitaki Catchment has a diverse wildlife population including native wading birds, indigenous fish species and invertebrates. Bird-watching is a popular activity for visitors throughout the Upper Catchment, with recognised sites at the Ahuriri, Ohau, and Tekapo River deltas, Lake Ruataniwha, the Ohau Ponds and Lake McGregor.

Picnicking

Picnicking occurs at designated rest and picnic spots located alongside the catchment's main lakes and rivers, and informally next to rivers, streams and creeks in the back country. Notable picnic spots include Lakes Benmore, Middleton, Ohau, Pukaki, Tekapo, Wardell, Aviemore and the Omarama Stream.

Camping

There are many camping areas in the Upper Waitaki including private campgrounds, council owned and operated camp sites and remote Department of Conservation (DOC) reserves that have huts or

⁹⁸ O'Neill & Pfluger (2004).

⁹⁹ O'Neill & Pfluger (2004).

¹⁰⁰ Kennett (1999).

¹⁰¹ Pickering (2006).

¹⁰² O'Neill & Pfluger (2004).

sites for tents. A number of campgrounds provide water access for motorised and non-motorised boats, including 4WD tracks, jetties and boat ramps. Camping is especially popular during the summer holiday period, Labour Weekend and at Easter.¹⁰³ The Inventory of Recreation Values for Rivers and Lakes of Canterbury New Zealand rates the following water bodies as those with a ‘high intensity’ of camping around their margins: the Hopkins and Ahuriri Rivers and Lakes Tekapo, Ohau, Middleton, Benmore and Aviemore.

The camping grounds in the Upper Waitaki Catchment host domestic holiday makers and international tourists. Nine of them are recognised as official camping grounds by the Mackenzie District Council and another two as authorised independent camping sites. Six are located near Tekapo, two near Twizel, one at Lake Pukaki, one at a DOC site in the Mount Cook National Park, and one at Sawdon-Black Forest. They include reserves solely providing tent sites to operators supplying a broad range of accommodation. The Waitaki District Council also permits campers to occupy several sites in the vicinity of Lakes Ohau, Benmore and Aviemore. It issued 140 seasonal and 1,559 overnight tickets for these sites during the 2012-2013 camping period.

Four Wheel Driving (4WD)

Numerous tracks suitable for recreational four wheel driving exist in the Upper Waitaki Catchment. The semi-wilderness terrain and variety of landforms of these tracks provide a range of challenges and opportunities for drivers to enhance their skills. Examples include the Dobson Valley, the Black Forest Road route, the Macaulay/Godley and the Tekapo River routes.

4.2 Outdoor recreation in the Lower Waitaki

People pursue a wide range of land and water-based recreational activities in the Lower Waitaki catchment.¹⁰⁴ The area is very important recreationally,¹⁰⁵ providing opportunities for a wide-variety of land and water-based activities. The natural features of the Waitaki River as a “big” river below the dams and hydro lakes, and the “wilderness” experience gained from activities in the river bed, are valued by many recreational users, especially anglers and jet boaters. Furthermore, there are several jet-boat operators and guides operating along the Waitaki River who provide commercial services for anglers and thrill seekers. The Hakataramea and Maerewhenua Rivers are also important resources.

While individuals from throughout New Zealand and overseas engage in activities on the Waitaki River, a high proportion of recreational users are local and regional residents. About 80 per cent of residents of communities in the Waitaki Valley visit the river at least once a year, and 25 per cent of them visit it weekly.¹⁰⁶

The main activities are fishing, whitebaiting and eeling, swimming, walking, viewing, bird watching, photography and picnicking, boating, waterfowl and other hunting, swimming, cycling, horse riding and off-road biking.¹⁰⁷

¹⁰³ O’Neill & Pfluger (2004); Maynard et al. (2009).

¹⁰⁴ A full description of these activities is provided in the Recreation Report by Rob Greenaway & Associates and Boffa Miskell Ltd (2006). See also, Meridian Energy (2006).

¹⁰⁵ In 2004, the Ministry for the Environment categorised the Waitaki River (including its lower reaches) as a *Potential Water Body of National Importance for Recreation Value* noting the following recreational values: birdwatching, canoeing or kayaking, fishing, general sightseeing, jet boating, tramping and walking (MfE, 2004: 19).

¹⁰⁶ Meridian Energy (2006).

¹⁰⁷ Meridian Energy (2006:4-75).

Fishing and access

The main river activity undertaken by locals is fishing for trout and/or salmon, but they also visit the river for walking, swimming, viewing and picnics.¹⁰⁸ The river, including a number of tributaries, is unique for its combination of salmon and trout (brown and rainbow). It is regarded as a nationally significant recreational trout (rainbow and brown) and salmon¹⁰⁹ (Chinook) fishery. It is the fourth-most fished river in the South Island and the most intensively fished of any river section in the Central South Island Fish and Game Region. “During peak salmon runs, hundreds of anglers can be found on the river on any given day”.¹¹⁰ The 2002 Waitaki River Recreation Survey (Greenaway, 2002) found that the main reasons anglers chose to fish the river were, in order of importance: good fishing, proximity to home and easy access. Several fishing guides operate along the Waitaki River, providing services for anglers without local knowledge of the trout and salmon fisheries.

Fishing on the Lower Waikiki is by foot access, jet boat and drifting. Fifty access points to the river were identified by respondents to a river survey and a community survey in 2002, the most popular (in descending order) being the Kurow Bridge and the recently developed Kurow Island reserve, northern river mouth, SH1 boat ramp, southern river mouth, Lower Waitaki irrigation intake, the Redcliffs-Ikawai irrigation intake, and the Ferry Road (south) boat ramp.¹¹¹

On the western stretch of the river, above Black Point and Stone Wall, respectively, comments from the community indicate that the number of public access points to the river bed is limited, particularly on the north bank. West of Stone Wall area, on the north side, the main access ways in the long stretch up to the Kurow bridge and Hakataramea village are over private land, necessitating local knowledge and gaining permission from farmers.¹¹² On the south side there are several public roads that allow access, although some of these are gated. Once down to the river on the south side it is possible to move considerable distances along an old roadway with a suitable vehicle, although again local knowledge helps. Once in the main river bed, movement by foot is restricted by the size of the main streams, and thick willow and gorse growth, making boats (usually jet boats) a key form of internal access.

The big river characteristics and difficult access in this western stretch of the river tend to attract recreational users with a high degree of local knowledge, expertise and experience. A 2002 river recreation survey of 398 visitors undertaken as part of the assessment for Project Aqua found that a fifth of river users resided in the Waitaki Valley, two-fifths in the wider region (Oamaru, Waimate, Timaru and Temuka) and another quarter were from the remainder of the Canterbury and Otago regions.¹¹³

The Hakataramea River is the Lower Waitaki River’s largest tributary. It offers 30kms of fishable water.¹¹⁴ It is a very popular angling river with a longstanding reputation for producing good sized Brown Trout and is seen as especially important as an alternative fishery given the decline in coastal streams. This has attributed to its recognition as a “first-class” fishery¹¹⁵ although there is evidence of decline in the fishery in recent years, attributed by a guide as being the result of water extraction

¹⁰⁸ Rob Greenaway & Associates and Boffa Miskell Ltd, 2006: 79-81.

¹⁰⁹ Greenaway (2007) notes that while the salmon fishery has declined in recent decades in terms of catch estimates, the salmon fishery maintains its national significance and is considered one of the four best salmon fisheries in New Zealand.

¹¹⁰ Greenaway (2007): 6.

¹¹¹ Rob Greenaway & Associates and Boffa Miskell Ltd, (2006: 58-59).

¹¹² Taylor Baines and Associates (2006).

¹¹³ Rob Greenaway & Associates and Boffa Miskell Ltd. (2006: 80).

¹¹⁴ Interview. See also Kent (2006: 207).

¹¹⁵ Draper (2008).

and dry years.¹¹⁶ Rainbow Trout are present in the river but not in the same abundance as browns. The river is also a very important salmon spawning site.

The river is popular with locals and visitors alike.¹¹⁷ It is also “culturally significant to Tangata Whenua as an important source of mahinga kai, and as an alternative route inland. The catchment was a noted and popular indigenous fishery, offering tuna (eel), kanakana (lamprey), kōkopu, waikōura (freshwater crayfish) and waikākahi (freshwater mussel). There are wāhi tapu and wāhi taonga associated with the river”.¹¹⁸ The river is also a popular for swimming, picnics, camping and fishing, especially in the lower reaches.¹¹⁹

The Maerewhenua River, a small clear stream, is the main spawning tributary of the Waitaki and can fish “very well”, particularly in its upper reaches where there are deep fishable pools. “Before water was extracted for irrigation, the Maerewhenua was a highly regarded fishery. Now, because of low water flows, the river is best fished early in the season ... the upper reaches provide more stable water, with deep pools in gorgy tussock terrain ... most branches require a lot of walking and some scrambling in certain sections” .¹²⁰

Jet Boating

The Lower Waitaki River – particularly the stretch from Kurow to State Highway 1 Bridge – is very highly valued by New Zealand jet boaters. This appreciation extends to international boating enthusiasts who attend jet boating events held on the river. The New Zealand Jet Boating Association organises a number of events on the river each year, including regional, national and international competitions¹²¹ and also professionally guided family outing days. The river provides experienced jet boaters with a rare and challenging ‘big river’ experience which can be attributed to the river’s considerable length, braided nature (with multiple channels) and variable flows.¹²²

For jet boaters and anglers using small craft to access the river, formal launching ramps are a critical amenity. These are provided at: Kurow Bridge, Duntroon and on the Southbank downstream of State Highway 1 Bridge. “Other opportunities exist for boat launching in favourable conditions along the northern and southern river margins, including at Ferry Road, Priest Road, the Lower Waitaki irrigation intake (Bortons), Henstridges Road, and east of the Hakataramea confluence”.¹²³ Fish and Game New Zealand (online) suggest that “launching by conventional vehicle is limited to SH1 bridge (south side), a marked track adjacent to the Kaik Motor Camp, Ferry Road, Duntroon (northern side of the Maerewhenua River) and at the Twin Bridges, Kurow on the island between the northern and southern braids.” Given the changing nature of the braided river system and its variable flow regime, popular launch sites come and go, the most reliable being at the Kurow Bridge, Duntroon and Ferry Road).¹²⁴

¹¹⁶ Evidence of Wayne Grafton to ECAN on Resource consent applications, Lower Waikiki Applicants.

¹¹⁷ Evidence of RW Sutton to ECAN, on 35 applications to take and use groundwater from the Waitaki River Catchment.

¹¹⁸ Lower Waitaki South Coastal Canterbury Zone Implementation Programme (n.d.)

¹¹⁹ Lower Waitaki South Coastal Canterbury Zone Implementation Programme (n.d.)

¹²⁰ Kent (2006: 206-207).

¹²¹ These events include marathon events and sprint competition, the latter of which utilises a dredged jet sprint course downstream of Kurow Bridge (Greenaway, 2007).

¹²² Greenaway (2007).

¹²³ O’Neill and Pfluger (2004: 90).

¹²⁴ Greenaway (2007).

Kurow Island

Another important river recreation area (for fishing but also many other recreation activities) is Kurow Island. The Waitaki Valley Community Society – who administer the “Visit Kurow” website – describe the values of the island, an old landfill site once covered in woody weeds and developed by a community initiative. Values include its geomorphology and recreational significance, with historic bridges (since replaced by the new bridges but with a relic left on the Island), wildlife, picnicking and boat access point.¹²⁵ Restoration of the Island has been a focus for the Kurow Town Enhancement Group for several years.¹²⁶

5 Concluding comment

This social and economic profile covers the upper and lower parts of the Waitaki River Catchment in South Canterbury. It is based on a combination of data sources including two supporting reports that cover detailed demographics and an on-line survey of recreational activity in the Upper Catchment. Where possible, details are provided about the people and communities of sub catchments as defined by ECAN.

The purpose of the profile is to provide the baseline for assessing future land uses and limits to nutrient discharges. Takes of water are covered by the Waitaki Catchment Water Allocation Regional Plan. The two Zone Committees are developing a package of measures to meet their zone objectives through a sub-regional plan as part of the Land and Water Regional Plan. Zone objectives include social, economic and cultural objectives, requiring this baseline information for the purposes of assessing their proposed measures.

The social and economic profile describes a wide range of values attached to the water bodies in the catchment. These include productive and consumptive uses of water that provide reliable irrigation, and stock water supplies, aquaculture and drinking water. Hydro-electricity is a major component of catchment GDP. There are also important recreational, ecological and intrinsic values of rivers, streams, groundwater and drains, lakes (natural and man-made) and wetlands, and the recreation and tourism sector is a further major component in the catchment economy. The many values associated with water shape the people and communities of the Catchment, their social organisation, identities, and ways of life. Water enables people to gain economic livelihoods and therefore meet social needs.

¹²⁵ <http://www.kurow.org.nz/things-to-do-Kurow-Waitaki-Valley.html> accessed 10-06-2014.

¹²⁶ With support from Meridian Energy, Waikiki District and the Department of Conservation.

References

- Aoraki Development Trust (nd). Brochure describing South Canterbury. Aoraki Development Trust, Timaru.
- Aubrey, F. M. (1978). Omarama, Place of Light and Early Waitaki Valley. Francis Aubrey, Omarama.
- Bendien, J. (1983). The wind-down of Twizel. Unpublished paper, Centre for Resource Management, Lincoln College, Canterbury.
- Benmore Salmon, High Country Salmon, and Mt Cook Alpine Salmon (2013). Mackenzie Basin Aquaculture. Overview Presentation to Upper Waitaki Zone Committee. 18 October 2013.
- Boffa Miskell (2003). Community effects assessment report. Appendix M to Project Aqua: Assessment of Effects on the Environment. Prepared for Meridian Energy.
- Business and Economic Research Ltd (nd). The role of tourism in Mt Cook/Mackenzie Tourism RTO 2009. Business and Economic Research Ltd, Wellington.
- Department of Building and Housing (2011). Building Consent Statistics: A summary of selected NZ data. May 2011.
- Fitzgerald, G. and Taylor, N. (2000). A Case Study of Twizel. Working Paper 22, Resource Community Formation and Change, FRST Project TBA 801. Taylor Baines & Associates, Christchurch.
- Kennett, P. (1999). Classic New Zealand Bike Rides. Kennett Bros., Wellington.
- Leung-Wai, J. (2013). BERL Regional Rankings 2012. Business and Economic Research Ltd, Wellington.
- Livestock Improvement Corporation Ltd and DairyNZ (2009). New Zealand Dairy Statistics 2008/2009. Livestock Improvement Corporation Ltd, Hamilton. Downloaded from <http://www.lic.co.nz> 4 May 2012.
- Livestock Improvement Corporation and DairyNZ (2012). New Zealand Dairy Statistics 2011-12. DairyNZ, Hamilton. Downloaded from <http://www.lic.co.nz> 23 November 2012.
- Local Services Mapping (2009). South Canterbury Community Profile 2009. Family and Community Services, Ministry of Social Development, Wellington.
- Lough, R.S. (2009) The current state of rabbit management in New Zealand: Issues, options and recommendations for the future. Contract report for MAF Biosecurity New Zealand, Wellington.
- Mackay, Mike, Wilson, Jude and Nick Taylor (2014). Community views about impacts of the 'Alps 2 Ocean' cycle trail on the rural village of Otematata. Poster paper to the New Zealand Association for Impact Assessment Annual Conference, Auckland.
- Mackenzie District Council (nd). Mackenzie District Council Long Term Plan 2012-2022. Mackenzie District Council, Fairlie.
- Maxwell, J. (1990). Lake Tekapo School 1940-1990 and other small schools in the Mackenzie Country from 1923. Lake Tekapo School Jubilee Committee.
- McClintock, W. (1999). Profiles of Energy, Fishing and Tourism Communities. Working Paper 19, Resource Community Formation and Change, FRST Project TBA 801. Taylor Baines & Associates, Christchurch.

McClintock, W., Taylor, N. and McCrostie Little, H. (2002). Social Assessment of land use change under Irrigation. Working Paper 33 prepared for the Foundation for Research Science and Technology Project - Resource Community Formation & Change (TBA X0001). Taylor Baines & Associates, Christchurch.

McCrostie Little, H., Taylor, N. and McClintock, W. (1998). A Case Study of Waitaki Plains. Working Paper 14 prepared for the Foundation for Research Science and Technology Project - Resource Community Formation & Change (TBA 601). Taylor Baines & Associates, Christchurch.

Marwick, J. And Esplin J. (2009). Waimate Health Services: Model of Care Report. Prepared under the Waimate Health Services Model of Care project sponsored by the South Canterbury District Health Board. Sky Blue House Limited and Acumen Quality Solutions.

Meridian Energy (2006). Application for Water Consents for a North Bank Tunnel Concept.

Ministry for Environment (2004). Potential Water Bodies of National Importance for Recreation. MfE number 559. Ministry for the Environment, Wellington.

Ministry for Primary Industries (2012). National Exotic Forest Description as at 1 April 2012. Ministry for Primary Industries, Wellington. Downloaded from http://www.mpi.govt.nz/news-resources/publications/12_March_2013

Ministry of Tourism (2004). Waters of National Importance for Tourism. Ministry of Tourism, Wellington.

Molana, W. and Dixon, H. (2011). 2010 Economic Profile for Waitaki District. Report to Waitaki Development Board. Business and Economic Research Ltd (BERL), Wellington.

Morris, Carolyn; Fairweather John R. and Simon R Swaffield (1997). Investigating Community: Imperatives for but constraints against land use change in the Mackenzie/Waitaki Basin. Agribusiness and Economics Research Unit, Research Report 236, Lincoln University.

Natusch, G. G. (1984). Waitaki dammed: and the origins of social security. Otago Heritage Books, Dunedin.

North Otago Citizens Advice Bureau (2010). Waitaki District Community Group Directory 2010. North Otago Citizens Advice Bureau, Oamaru.

O'Neill, P. and Pflugger, Y. (2004). Waitaki Catchment Recreation and Tourism Activities. Report prepared by Leisure Matters for the Ministry of Environment. MfE number 567. Ministry for the Environment, Wellington.

Opus International Consultants Ltd (2011a). Catchment Assessment: Tekapo Drinking-water Supply. Opus International Consultants Ltd, Wellington.

Opus International Consultants Ltd (2011b). Catchment Assessment: Twizel Drinking-water Supply. Opus International Consultants Ltd, Wellington.

Pickering, M. (2006). Mackenzie Country and Upper Waitaki River Walks, Daytramps and Mountain Bike Trails. Mark Pickering, New Zealand.

Schilling, C., Zuccollo, J. and Nixon, C. (2010). Dairy's role in sustaining New Zealand - the sector's contribution to the economy. Report to Fonterra and Dairy NZ. New Zealand Institute of Economic Research, Wellington.

Scott, D.; Maunsell, L. A.; Keoghan, J. M.; Allan, B. E.; Lowther W. L. and Cossens, G. G. (1995). A guide to pastures and pasture species for the New Zealand high country. Grassland Research and Practice Series, No. 4, New Zealand Grassland Association Inc., Palmerston North.

Sheridan, M. (1995). Dam Dwellers: end of an Era. Sheridan Press. Twizel.

Taylor Baines and Associates (1996). Rabbit and Land Management Programme social and institutional monitoring, end of programme evaluation. Research report to Ministry of Agriculture, Wellington

Taylor Baines & Associates (1997). Communities of Interest in the Waitaki Valley: An Initial Assessment. Report prepared for the Canterbury Regional Council, Taylor Baines & Associates, Christchurch.

Taylor Baines and Associates (2006). Waikiki North Bank Tunnel – hydro-electricity proposal: Social Impact Assessment – Stage One (Waer Consents Application). Report to Meridian Energy Ltd.

Taylor, C. N. and Bettsworth C. M. (1983). Social Characteristics of New Zealand Hydrotowns: A Case Study. Information Paper No.1, Centre for Resource Management; Lincoln College and University of Canterbury, Christchurch.

Taylor, C. Nick and Baines, James (1990) Social and institutional monitoring and evaluation in the Rabbit and Land Management Programme. Report for Phases 1 and 11 covering the period November 1989 to May 1990.

The Agribusiness Group (2010). North Otago Irrigation Company: The economic benefit to the community. Report prepared for the Waitaki Development Board.

Waugh Infrastructure Management Ltd (2012). Waitaki District Council Activity Management Plan for Water 2012-22. Waugh Infrastructure Management Ltd, Timaru.

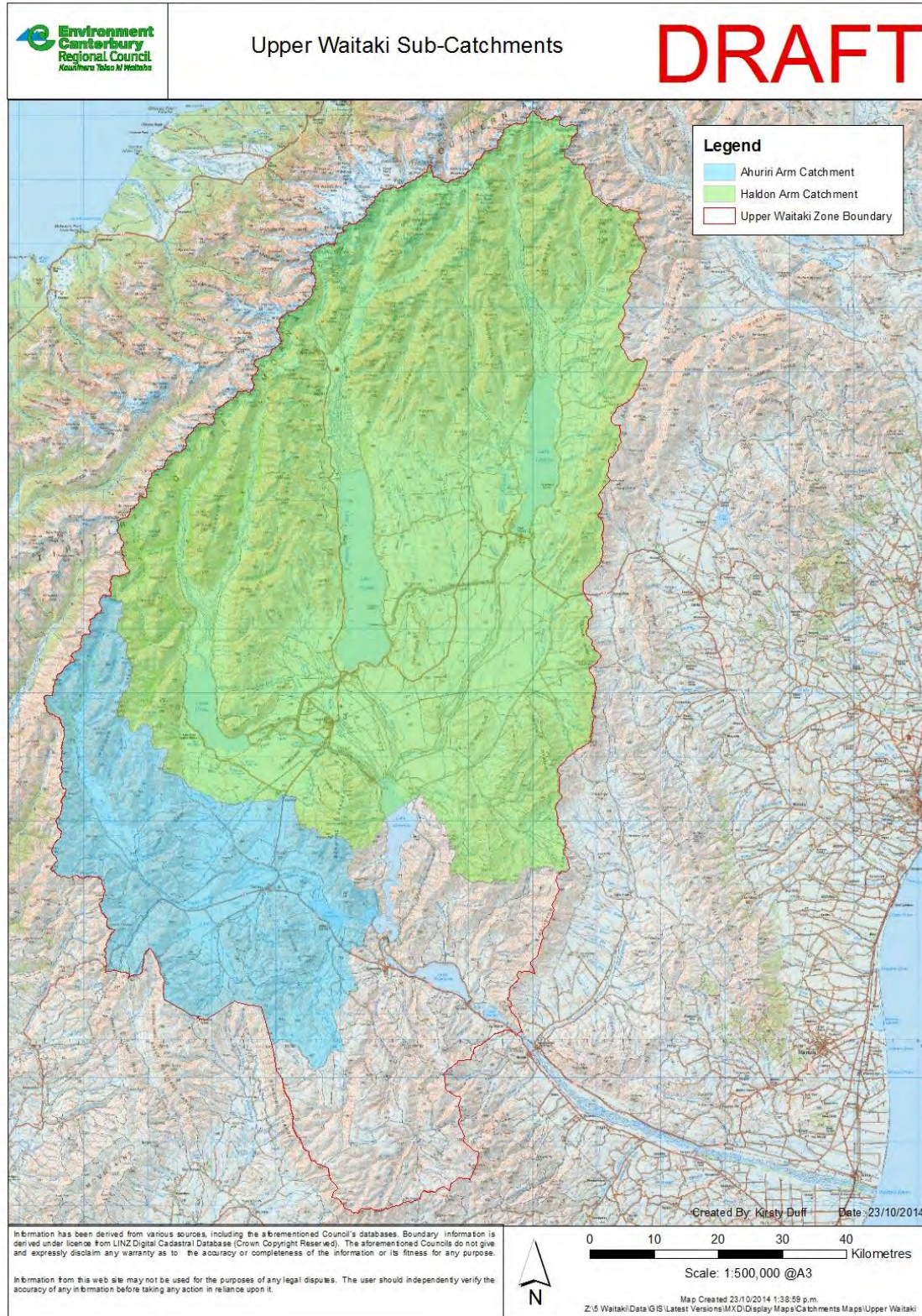
Waimate District Council (2012). Water Asset Management Plan: February 2012. Waimate District Council, Waimate.

Waitaki District Council (nd). Volume one: Long Term Plan 2012-2022. Waitaki District Council, Oamaru.

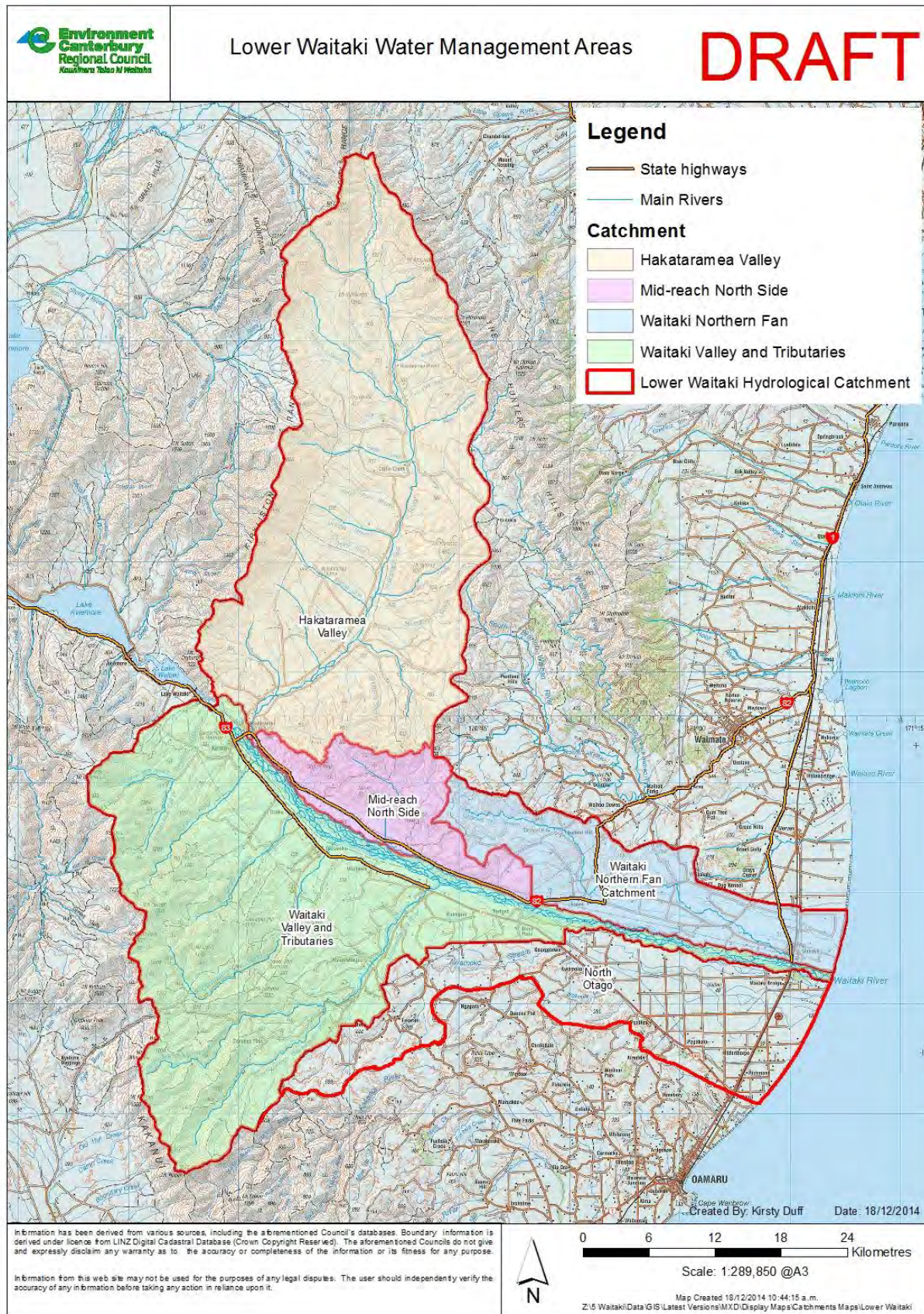
Wilson, J. (1999). Waikakahi: Fulfilling the Promise. The Waikakahi Centennial 1999 Incorporated Society, Waimate.

Attachment 1 Maps of Catchment and sub catchments

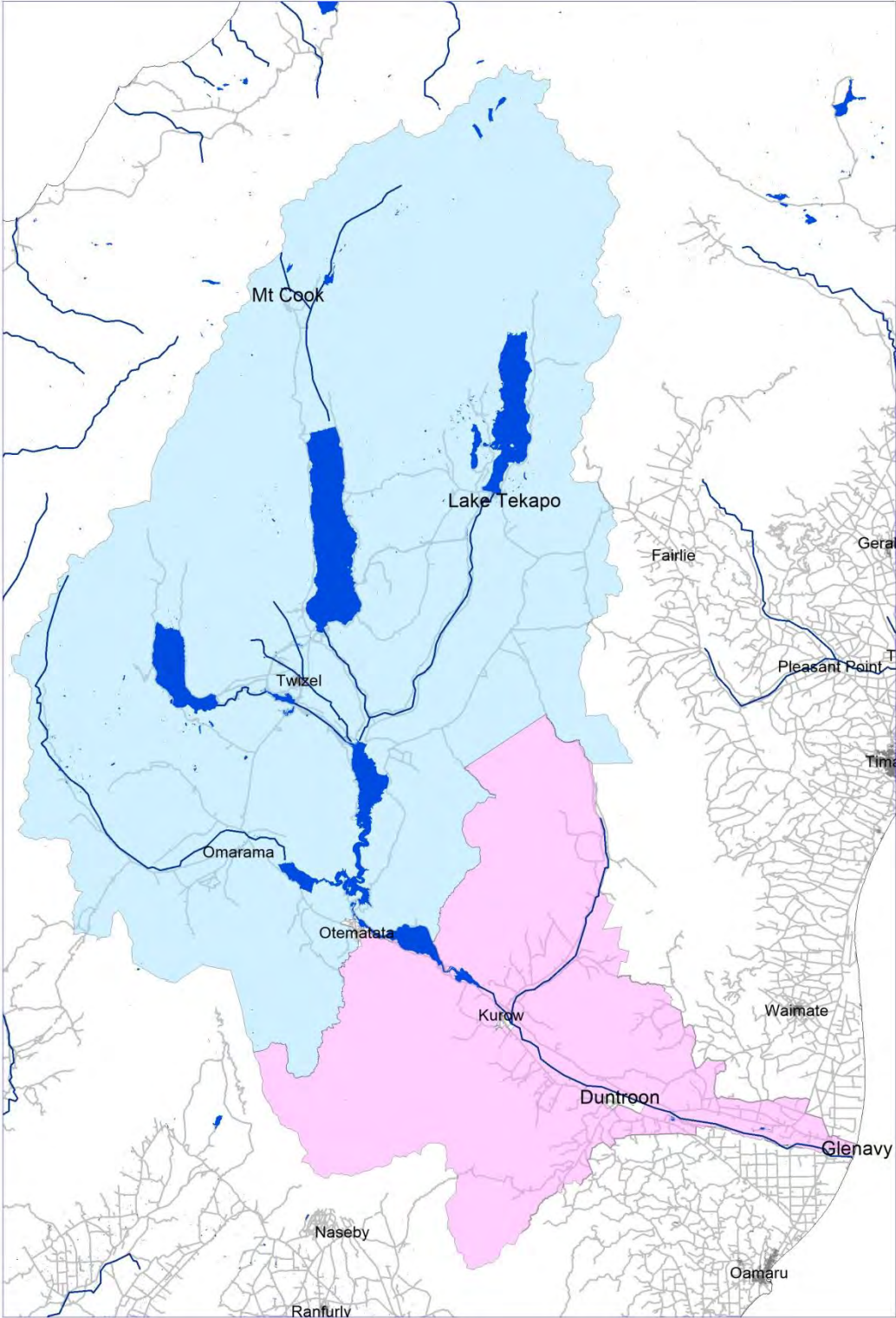
Map 1 Upper Waikiki sub catchments



Map 2 Lower Waikiki sub catchments



Map 3 Waikiki Catchment settlements



Attachment 2 Method for Estimation of Direct Impacts

Farm financial data

A set of revenue, expense and cash farm surplus estimates were derived from a number of sources. Ogle (2014) provided estimates of farm revenue and expenses for three model sheep and beef operations in the basin, with estimates of stocking rates for different land classes within each operation. These figures were checked by interview with a number of operations in the catchment, and were peer reviewed by an accountant with a number of clients in the catchment (Graham Brown, Brown Glassford). These estimates were aggregated into a single model weighted by stock units in each model class. The number of stock units in each model class was estimated based on the area of land in each land class (slope, soil and development combinations) multiplied by the estimated stocking rate for each land class.

DairyNZ provided model budgets for a composite dairy and dairy support operation in the catchment. This was re-estimated on a per cow and per ha basis. The estimates of revenue, fixed and variable expenses are shown in Table A21 below.

Data for aquaculture operations was based on interviews with the three companies operating in the catchment. This data was aggregated on a weighted basis for future production estimates.

The structure of the hydro generation operations in the catchment is based on previous work undertaken for the Waitaki Water Allocation Board, Project Aqua and the North Bank Tunnel (G. Butcher, pers.comm). The revenue for hydro generation can be extremely variable, and estimates vary depending on the approach taken. Specific hydro generation revenue may not be available because the electricity is at least partly utilised internally by the retail operations of the two companies involved. For the purposes of this exercise we have used Meridian's internal transfer price of \$85/MWh as indicative of the value of this electricity. It should be noted however that this value will vary significantly depending on the year and method chosen for valuation.

The economic structure of tourism businesses is more difficult to determine. Interviews were undertaken with a number of business entities across the tourism sector. Data was purchased from Infometrics on business structure in the Mackenzie District, which was combined with mesh block level employment data sourced from Statistics NZ through its business Frame dataset¹²⁷, so that the impacts were pro-rated on an employment basis. This was checked against available interview data to ensure that the structures matched in a general sense, and that the sourcing of inputs was appropriately reflective of local experience.

The EBIT or operating profit was estimated as shown in Equation 2. For dairy, the revenue and variable expense data was adjusted linearly for differences in stocking rate. This results in profitability increasing with increasing stocking rate. For dairy this can be problematic since there are situations where operators with low stocking rates have similar or better profitability than those with high stocking rate, and management skill is probably a better predictor of profitability than

¹²⁷ Originally it had been intended to estimate an IO table directly from the Business frame employment data and national level business structures, but the catchment mesh block data proved too unreliable to generate a model of the catchment. The Infometrics data was therefore used as a proxy for local catchment effects.

stocking rate. However the data in the Dairy NZ Economic survey¹²⁸ for the last two years has shown a national trend of increasing profitability with increasing stocking rate, and the authors note that this is driven largely by the relationship between milksolids price and cost of feed. Therefore the relationships outlined here may not hold in all situations and across all time periods. For arable, horticulture and forestry properties a fixed budget was used (Equation 3), with data sourced from MPI monitoring information. The figures used are shown in Table A21 below, and the aggregate for each land use in the catchment was estimated by the area of each land use times the EBIT for that land use.

For sheep and beef and deer the revenue, fixed and variable expenses were calculated per stock unit. The total stock units on this land use across the three climate zones were calculated from the areas of different soil type and the stocking rate per soil type.

Because the fixed costs for hydro generation do not change, any changes to the value of electricity generated in the catchment are reflected directly in the EBIT estimate. The individual estimates for hydro are not presented for confidentiality reasons.

For aquaculture the revenue and expenditure estimates were broken down on a per tonne basis, then multiplied by the estimated tonnage produced. Because the three operations differ significantly in their markets and operational structures, all figures were averaged on weighted tonnage basis.

Equation 1: EBIT calculation for sheep, beef and deer land use

$$EBIT_{(lu)} := (R_{lu} \times SU_{(lutot)}) - FWE_{(lu)} - (VWE_{(lu)} \times SU_{(lu)})$$

Where:

$EBIT_{(lutot)}$ = Total Earnings before Interest, tax, depreciation and other capital charges (\$/annum)

$R_{(lutot)}$ = Total Revenue per stock unit (sheep, beef and deer) (\$/su/annum)

$SU_{(lutot)}$ = number of stock units total across all land in catchment (sheep, beef and deer)

$FWE_{(lutot)}$ = Fixed Working Expenses total. (\$/ha per annum)

$VWE_{(lutot)}$ = Variable working expenses total (\$/su/annum)

Equation 2: EBIT calculation for dairy land use

$$EBIT_{(lu)} := (R_{lu} \times SU_{(lu)}) - FWE_{(lu)} - (VWE_{(lu)} \times SU_{(lu)})$$

Where:

$EBIT_{(lu)}$ = Earnings before Interest, tax, depreciation and other capital charges (\$/ha/annum)

¹²⁸ Dairy NZ, May 2011. DairyNZ Economic Survey 2009-10.

$R_{(lu)}$ = Revenue per cow (dairy) (\$/cow/annum)

$SU_{(lu)}$ = number of cows per ha (dairy)

$FWE_{(lu)}$ = Fixed Working Expenses per ha. This includes all items that do not typically vary at the margins with changes in intensity (\$/ha/annum)

$VWE_{(lu)}$ = Variable working expenses per ha. These expenses are expected to change as stocking rate changes (\$/cow/annum)

Equation 3: EBIT calculation for arable, horticulture, forestry and aquaculture

$$EBIT_{(lu)} = R_{lu} - FWE_{(lu)}$$

Where:

$EBIT_{(lu)}$ = Earnings before Interest, tax, depreciation and other capital charges per ha or per tonne (\$/ha/annum, \$/tonne/annum)

$R_{(lu)}$ = Revenue per ha for arable, horticulture and forestry (\$/ha/annum) or per tonne for the aquaculture sector (\$/tonne/annum)

$FWE_{(lu)}$ = All Working Expenses per ha or per tonne. (\$/ha/annum, \$/tonne/annum)

Equation 4: EBIT calculation for catchment

$$EBIT_{(c,lu)} = \sum_{lu} EBIT_{(lu)} \times area_{(lu)}$$

Where

$EBIT_{(c,lu)}$ = EBIT for each land use in the catchment (\$/annum)

$Area_{(lu)}$ = Area of each land use in the catchment (ha)

Estimates of regional outcomes from changes in agricultural land use were derived from catchment and regional input/output model. The catchment model was based on the Infometrics Mackenzie dataset, while the regional model was based on Butcher Partners regional model. These were both altered to include detailed sectors covering dairy, dairy support, sheep and beef, and aquaculture. The hydro and tourism models were estimated as described above, with the hydro regional model assumed to be equivalent to the catchment level model. This is likely to underestimate the regional impacts of hydro generation because it will not include a number of head office activities that may need to be directly attributed to the hydro generation activities. However given the difficulties of separating out the attribution for different parts of the energy companies' businesses (eg retail vs

wholesale, in and out of region generation activities) for the purposes of this exercise it is likely to be sufficiently accurate. Furthermore regional input/output modelling tends to overestimate the total impact because it does not include feedback effects¹²⁹, but is the only model type suitable for use at this scale.

Table A21: Financial data used by land use for upper Waitaki catchment

Land Use Types	Stocking rate	Revenue (\$/annum)	Fixed Working Expenses (\$/ha/annum)	Variable working expenses (\$/stock/annum)
Arable irrigated		\$3,867	\$2,554	
Arable Dry		\$1,611	\$1,064	
Dairy Irrigated	3.4	\$2,871	\$169	\$1,560
Dairy Support irrigated		\$2,153	\$1,508	
Dairy Support Dryland				
Exotic Forest		\$928	\$727	
Viticulture		\$20,415	\$9,928	
Sheep, beef and deer dryland	Total Stock Units	\$101	\$22	\$55
Sheep, beef and deer irrigated	Total stock units	\$101	\$22	\$55

¹²⁹ For example where a change increases demand for labour in an area, which results in higher wages, which in turn impacts on demand for labour across a range of sectors.