Canterbury Water Management Strategy Targets

Progress Report June 2015
Canterbury Water Management Strategy

A collaborative Canterbury process brought to you by:

- Ashburton District Council
- Christchurch City Council
- Environment Canterbury
- Hurunui District Council
- Kaikōura District Council
- Mackenzie District Council
- Selwyn District Council
- Timaru District Council
- Waimakariri District Council
- Waimate District Council
- Waitaki District Council
- Mayoral Forum
- The office of Te Rūnanga o Ngāi Tahu
- Papatipu Rūnanga
- Arowhenua
- Kaikōura
- Koukourārata
- Moeraki
- Ngāi Tūāhuriri
- Ōnuku
- Rāpaki
- Te Taumutu
- Wairewa
- Waihao
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Foreword

Implementation of the Canterbury Water Management Strategy continues to be one of the highest priorities for Environment Canterbury. We know that water is highly valued and that people who live and work in the region have significant expectations around water quality, water use and quantity. It is also an issue that creates significant tension and debate. The Strategy provides a collaborative framework to assist in managing the multiple demands on our precious water resource.

The overarching vision for the Strategy is “to gain the greatest cultural, economic, environmental, recreational and social benefits from our water resources within a sustainable framework both now and for future generations”.

The success of the Strategy is a key component in the continuing success and growth of Canterbury’s economy. Because of its value to the region, I encourage everyone to learn as much as possible about the Strategy and what is being achieved.

A key component in achieving the Strategy’s vision was the development of a set of targets for water management in Canterbury through to 2040. The targets are an agreed way to measure progress in achieving the vision.

The following targets have been developed:

1. **Ecosystem health and biodiversity**
2. **Natural character of braided rivers**
3. **Kaitiakitanga**
4. **Drinking water**
5. **Recreational and amenity opportunities**
6. **Water-use efficiency**
7. **Irrigated land area**
8. **Energy security and efficiency**
9. **Indicators of regional and national economies**
10. **Environmental limits**
This report is the second report against the targets and demonstrates that in most areas we have made significant headway and progress. However this is a long-term strategy and we are less than a third of the way into the programme. It is a marathon, not a sprint and we still have much work to do.

I want to take the opportunity to acknowledge the partners in this process. The Canterbury Mayoral Forum is the owner and driver of the Canterbury Water Management Strategy. Each of the region’s local authorities, Christchurch City Council, Te Rūnanga o Ngāi Tahu and local rūnanga have contributed to make this programme possible.

In addition, many individuals have given generously of their time by participating on Zone Committees and the Regional Committee. Without these contributions we would not have been able to achieve progress.

Finally it is important to acknowledge the generous shifts in thinking and attitude that groups and individuals have had to make in order to get the Strategy up and running. There is still much work to do but we have gained valuable ground and we should all feel proud of where we are today.

Dame Margaret Bazley ONZ, DNZM, Hon DLit
Chair of Commissioners, Environment Canterbury
Introduction

The Canterbury Water Management Strategy provides a collaborative framework for addressing issues related to sustainable management of our region’s water resource. The overall goal of the Strategy is to enable present and future generations to gain the greatest social, economic, recreational and cultural benefits from Canterbury’s water resources within an environmentally sustainable framework.

The Strategy sets targets for water management in Canterbury from 2010 through to 2040. Ten Zone Committees are responsible for developing water management programmes that give effect to these targets for their respective areas. Zone Committees are made up of community members, rūnanga and council representatives. They are appointed for three years and meet every few weeks to gather information about water in their zone to reach a consensus on a water management programme. Zone Committees are required to seek feedback and opinions from stakeholders and the community to ensure all interests are represented.

There is also a Regional Committee that considers regional issues of environmental restoration and repair; land use impacts on water quality; as well as water storage, distribution and efficiency options.

Environment Canterbury staff work closely with Zone Committees and provide the scientific information required to enable them to make informed recommendations.

A key component of the Strategy was the establishment of targets through to 2040. The targets were signed off by the Canterbury Water Management Strategy Steering Group in June 2010, following an extended process of stakeholder engagement, public consultation and joint collaboration with farming, recreation, conservation and environmental groups.

The targets are an agreed way to measure progress and include the following target areas:

1. Ecosystem health and biodiversity
2. Natural character of braided rivers
3. Kaitiakitanga
4. Drinking water
5. Recreational and amenity opportunities
6. Water-use efficiency
7. Irrigated land area
8. Energy security and efficiency
9. Indicators of regional and national economies
10. Environmental limits

It was agreed that biennial progress reports would be provided against the target areas. This is the second of the formal reports against targets.
When assessing progress it is important that the targets are viewed as a whole and not separately or in isolation. Targets inform each other and are designed to provide an overarching perspective as opposed to providing focus on one specific area or achievement. In addition, these are regional targets and they are not always relevant or applicable across all zones.

In many cases the targets do not reflect any statutory or legislative requirements but are aspirational. This factor impacts directly on the ability of stakeholders and participants in the Strategy to drive change. Essentially, targets can be influenced and shaped by Zone Committees and local authorities but are not able to be regulated.

It is also important to remember that the targets are set out until 2040. The 2015 report is an interim report on progress and milestones towards the 2015 targets with indicators which demonstrate positive movement as opposed to achievement. On the whole it is positive to see that overall trends in the 2015 report are tracking towards achievement of the long-term 2040 goals.

In some areas — particularly the Recreation and Amenity targets and targets for Indicators of National and Regional Economies — we are short on data. There is significant work currently underway to address this shortcoming and facilitate future effective reporting.

The report shows there is still a huge amount of work to be done if we are to meet the 2040 targets but progress is being made and there has been a real shift in many areas of measurement. This is largely due to the strength of the partnership approach that stakeholders have committed to.

Environment Canterbury and partner agencies continue to focus on the achievement of Canterbury Water Management Strategy objectives as a key component of their work programmes.
The CWMS is underpinned by collaboration; empowering communities to make their own decisions to meet agreed region wide and local targets. Through the CWMS, the process of setting Environmental Limits provides an opportunity for the community to take local ownership of water management and to work together through complex information to reach decisions on their priority outcomes and values.

Zone committees and communities are working collaboratively through the Resource Management Act (RMA) plan development timetable. This intensive process supports Environment Canterbury to meet its statutory responsibilities, work with the people of Canterbury to achieve sustainable management of the region’s water and land resources and align the planning framework to CWMS targets.

**ENVIRONMENTAL FLOWS & CATCHMENT LOAD LIMITS**

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**Progress**

**Setting Limits**

» Environment Canterbury has developed and started on a schedule of notified RMA Plans to set environmental flows and water quality limits (see Figure 1.1).

» The Land and Water Regional Plan (LWRP), effective from January 2014, sets the framework to implement community aspirations for water through the CWMS. The plan includes region-wide limits that apply across most of Canterbury. These limits apply now and are based on the Nutrient Allocation Zones (NAZ) around Canterbury. The more serious the water quality issues in a NAZ, the stronger the rules.

» By 2017 the LWRP will be updated to reference the Matrix of Good Management (see Box 1, page 12) which specifies numbers for nitrate and phosphorus losses and sets out good management practices across a range of land types, climates and land uses.

**Target 1:** Set environmental flows for surface streams, rivers and groundwater that are consistent with the fundamental principles of the CWMS and that:

- Are consistent with ecosystem health and biodiversity targets,
- For all braided rivers include flood peaks, flow variability, flood periodicity, and channel forming flows to maintain their braided character and ecosystems,
- Afford protection to instream values identified in Ngāi Tahu policies,
- Are consistent with the recreational uses of the water body,
- Consider all the target areas of this strategy.

**Target 2:** Set catchment load limits for nutrients for each water management zone that are consistent with the fundamental principles of the CWMS and that:

- Are consistent with ecosystem health, drinking water and biodiversity targets,
- Afford protection to instream values identified in Ngāi Tahu policies,
- Are consistent with recreational uses of the water body,
- Consider all the target areas of this strategy.

**Target 3:** Established and begun to implement a programme to apply environmental flows to existing consents.

**by 2015**

**Chapter 1: Environmental Limits**
Environmental Limits

The Collaborative Approach
Details on each stage are explained on page 10–11.

Zone Implementation Programmes
Catchment Modelling & Scenario Analysis
Community Consultation & Recommendations
Drafting the Plan
Submissions & Hearings
Decisions Reached

Figure 1.1: Progress on Environmental Limit-setting

The Collaborative Approach Details on each stage are explained on page 10–11.
THE COLLABORATIVE PROCESS

» At a catchment level, communities are involved in developing more detailed (sub-regional) plans and rules to put in place local solutions.

» The CWMS provides an opportunity for the community to take local ownership of water management and work together through complex information to reach decisions on their priority outcomes and values.

» There are six stages to the collaborative process (progress for each catchment is shown on figure 1.1):

1. Zone Implementation Programmes (ZIPS)

The collaborative community process is supported by the ten catchment based zone committees, established as joint committees of the District or City Councils and Environment Canterbury with membership from local rūnanga with five appointed community members.

Each of these committees has developed a non-statutory Zone Implementation Programme (ZIP) that identifies priority outcomes and practical water management actions for their own zone. Implementation of these ZIPS by committees, councils and other agencies is underway throughout the region.

2. Catchment Modelling & Scenario Analysis

Environmental and Flow Limit options are considered by the community and led by the zone committees. Using the outcomes and values described...
in the ZIP and with technical, facilitative and administrative support from Environment Canterbury, the community explores a range of scenarios to determine the social, cultural, economic and environmental consequences of setting limits.

3. Community Consultation & Recommendations
Scientists, planners and community members work together to understand complex technical information and incorporate local knowledge to arrive at meaningful options for water management.

The process is intensive requiring many community meetings and workshops and involves individuals and groups including rūnanga, rural professionals, rural women’s groups, farmers and irrigators and those with recreational and environmental interests.

The final output from this process is the ‘Solutions Package’ or ZIP Addendum which is then signed off by the zone committee. The zone committee recommendations are then endorsed by the local council(s) and by Environment Canterbury.

4. Drafting the Plan
The ZIP Addendum is then used as a basis for drafting the sub-regional section of the Land and Water Regional Plan. Council planning staff liaise with the Zone Committee to check if there are issues of inconsistency or conflict. As the plan is drafted, particular regard is given to the vision and principles of the CWMS (as defined in the Environment Canterbury Act 2010) in addition to the matters relevant under the RMA. Once drafted, the council receives and adopts the plan for formal notification in-line with RMA requirements and providing time for further public consultation.

5. Submissions & Hearings
The plan or variation goes through the standard process for submissions, amendments and re-notification. Independent hearings commissioners are appointed to hear the submissions and make recommendations. A further commissioner is selected for knowledge tikanga Māori.

6. Decisions Reached — Operative Plan
The Council adopts the recommendations and under the Environment Canterbury Act, the Decisions of Council are appealable only to the High Court and only on points of law. The normal appeal available under the RMA to the Environment Court has been removed, but this has proven to be a key driver in focusing stakeholders on achieving as much as possible at the front-end of the collaborative community process.

Once appeals to the High Court are resolved, the plan is formally adopted and becomes operative.
MANAGING TO LIMITS

» Environment Canterbury is encouraging all farmers to collect their nitrogen loss data and to use Overseer™ to prepare nutrient budgets.

» Farm Environment Plans (FEPs) and nutrient budgets are essential farm management tools. They are required under the LWRP because the plan sets limits on the amounts of nutrients such as nitrogen that can be leached into the environment especially in zones where current water quality objectives are not being met — the ‘red’ Nutrient Allocation Zones.

» Depending on the farm risk profile, the FEP will need to be audited regularly to monitor improvement in on-farm management practice.

» Since 2009, ten catchment based zone committees have been established as joint committees of the district or city councils and Environment Canterbury with membership from local rūnanga and appointed community members.

» More than 950 recommendations have been made by the Zone Committees and include setting catchment load limits and improving nutrient management.

» Annually updated zone based work programmes are in place for each Zone Committee with clear projects and milestones tailored to meet the Zone Committees’ five-year outcomes.

» Currently, there are more than 90 projects underway in partnership with industry and community groups, involving more than 3,400 stakeholders (see figure 1.2).
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FRESHWATER SPECIES AND THEIR HABITAT

Freshwater environments and their inhabitants have considerable ecological and cultural value. Yet, several native freshwater species are in decline, or are nationally threatened. Other introduced species are of significant value to recreational fisheries but can pose a threat to native freshwater fish. A regional habitat restoration programme is underway and takes a catchment-based approach to restoring the habitat of freshwater fish species.

from 2010
Implement actions to correct the decline in freshwater species, habitat quality or ecosystems.

by 2015
Target 1: No further reduction in the number and areas of existing salmon spawning sites.
Target 2: Increasing annual trout spawning counts in identified important areas (based on a 5-year average) as an indicator of habitat availability for salmonid and indigenous fish species.

from 2020
An upward trend in diversity and abundance of native fish populations. Increased the length of waterways with riparian management appropriate to aquatic ecosystem protection by 50% from 2010 figures.

INDICATORS
- The number, location and type of biodiversity protection/restoration projects, including funds allocated.
- Length of waterways with riparian management.
- Trout and salmon spawning counts in important areas.
- Occurrence of selected native fish populations with consideration of increasing elevation and distance inland.

Progress

- Immediate Steps programme — $4.2 million invested in more than 230 projects (figure 2.1)
- Regional Fish Habitat Restoration project — $100,000 per annum invested over three years
- Fish populations are surveyed intermittently by partners and the resulting data is available in the New Zealand Freshwater Fish Database maintained by NIWA.
- The annual Fish & Game NZ Salmon Monitoring Programme is focused on maintaining sustainable populations of harvestable species and monitoring spawning numbers in important areas.
- Fish & Game NZ is working with high country landowners, to protect and restore riparian areas and minimise intensive farming practices upstream and adjacent to spawning streams. There are also a number of industry programmes to support waterway restoration, including:
  - The Sustainable Dairying: Water Accord is a set of GMP benchmarks and involves mapping and measuring all waterways on supplier’s farms to ensure they have the required stock exclusion measures in place and appropriate riparian margins,
  - DairyNZ and Environment Canterbury have developed guidelines for land management in riparian margins,
  - Fonterra are currently developing technologies for farmers to report progress on fencing waterways and planting riparian margins.
  - Synlait’s certified Lead with Pride farms have Standard Operating Procedures to achieve best management practices in riparian management.
Immediate Steps Programme
Launched in 2010, ‘Immediate Steps’ is a five year $10 million biodiversity protection and restoration programme and is an integral part of the CWMS. Through Immediate Steps, $2 million is available annually for protecting and restoring biodiversity in and around freshwater habitats. Funding is allocated to on-the-ground actions aimed at halting or reversing the decline in indigenous biodiversity associated with increasing use of water. Project recommendations are considered by Zone Committees, with guidance from Environment Canterbury’s biodiversity officers and Canterbury Biodiversity Strategy partners.

Why is Immediate Steps needed?
Freshwater ecosystems provide an important habitat for many fish, insects, plants and birds. They act as corridors and ‘stepping stones’ that connect different habitats and ecosystems. Native biodiversity has declined over many years. Increased intensive land use such as vegetation clearance, water and gravel abstraction along rivers and streams, has degraded the natural habitat and caused pollutants to enter these freshwater ecosystems. The CWMS has highlighted declining health of the region’s freshwater ecosystems and the loss of native biodiversity as a key community concern for which specific targets have been set.

Immediate Steps flagship projects
The regional committee has decided on three flagship projects to support over the next five years: Te Waihora/ Lake Ellesmere enhancement project; enhancement of the upper catchments of the Rakaia and Rangitata rivers; and the Wainono Lagoon project.

Progress to date
As of May 2015, more than 230 projects have been awarded funding totalling $4.2 Million through the Immediate Steps Fund. These projects will see more than 230,000 native plantings and 190 kms of fencing to protect 1,000 ha of stream riparian margins, wetlands, lagoons and native bush.
Chapter 2: Ecosystem Health and Biodiversity

DRYLANDS

Drylands are unique ecosystems that provide habitat for rare and threatened species. Presently only around 3% (60,000ha) of dryland ecosystems in Canterbury are protected. Projects for protection and restoration are underway. Priority needs to be given to effective planning and regulatory mechanisms to ensure no further loss of remaining dryland biodiversity.

from 2010
Maintain existing high quality indigenous aquatic and dryland ecosystems in intermontane basins and on the plains.

INDICATORS
Change in number/area of high quality indigenous aquatic/dryland ecosystems in intermontane basins and on the plains, including number/area protected.

Progress

- Immediate Steps funding has awarded $110,000 to 12 projects.
- The Canterbury Biodiversity Strategy (CBS) has carried out an additional 46 projects, with $310,000 of CBS funding.
- Effective planning and regulatory mechanisms to achieve the CWMS target and ensure no further loss of remaining dryland biodiversity are being developed at a sub-regional level (see 'Environmental limit-setting, page 8)

WETLANDS

In Canterbury, freshwater wetlands have been reduced to just 10% of their original cover. The extent of coastal wetlands areas has been reduced by about half. Through Immediate Steps, each CWMS zone has conducted restoration projects in at least two wetland areas. Around 25% of wetland areas have formal legal protection. Planning provisions that protect the biodiversity values of natural wetlands, hapua and lagoons are critical.

from 2010
Prevent further loss of area of naturally occurring wetlands.

by 2015
Protected all and restored at least two significant wetlands in each zone.

by 2020/2040
Protected all Wetlands.

Progress

- Approximately 70 wetlands projects are now underway across the region with more than $1 Million of Immediate Steps funding allocated (see figure 2.3)
- Threatened wetlands areas have been identified, and Immediate Steps projects prioritised for restoration according to ecological and cultural ranking.
A regional inventory of wetlands areas has been created and mapped, with field work conducted in coastal areas to assess ecological condition.

The Protected Areas Network of New Zealand (PAN-NZ), shows around 25% of the wetlands on Canterbury Regional Wetland Maps have formal protection status.

Wetlands remain subject to the core provisions of the RMA that apply to freshwater bodies and the Coastal Marine Area. Planning provisions that offer additional protections are in place through the Land and Water Regional Plan (LWRP; see ‘Environmental limit-setting, page 8).

Potential ecological impacts on wetlands are assessed during consents processes and development.

Farm Environmental Plans (FEPs) are used to help protect wetlands and highlight their value on farms. FEPs will require nutrient soils and water bodies including wetlands to be managed to Good Management Practice.

**INDICATORS**
- Change in the number of wetlands protected/restored.
- Change in number/area of naturally occurring wetlands.
Chapter 2: Ecosystem Health and Biodiversity

HĀPUA, LAGOONS AND ESTUARIES

Te Waihora is one of New Zealand’s most important wetlands and is internationally significant for the abundance and diversity of wildlife. Te Waihora is a tribal taonga, central to Ngāi Tahu culture, and is valued by many for its recreation and cultural worth, and unique ecological value. There are many active organisations and agencies involved in work to protect, restore and enhance the lake. Whakaora Te Waihora is a joint programme of work between Environment Canterbury, Te Rūnanga o Ngāi Tahu, and the Ministry for the Environment. The Te Waihora Joint Management Plan — Mahere Tukutahi o Te Waihora — is a joint land management plan between the Crown and Iwi for integrated management of the Selwyn-Waihora catchment.

**INDICATORS**
- Change in area and location of restoration projects for Te Waihora/Lake Ellesmere and tributary streams.
- Change in the number and type of restoration projects for ecologically significant hāpua, lagoons and estuaries.
- Change in the ecosystem health of ecologically significant hāpua, lagoons and estuaries, and their adjoining ecosystems.

**Progress**

- Thousands of natives planted in Halswell/Huritini, Kaituna, Waiekekewai, and lake shore habitats.
- 53 Farm Environment Plans have been developed.
- Six major science investigations have been initiated to inform future action.
- Approximately 36 km of catchment drains re-graded, and where possible planted with native species;
- Support has been provided to Te Ara Kākāriki to deliver the Kids Discovery Plant-Out, with planting undertaken by pupils and teachers from local schools.
- Large-scale willow eradication at six key lake margin sites to protect and restore significant indigenous wetland habitat
- A strategic communications plan implemented, with regular stories at http://tewaihora.org/ourstories/.
- A new planning framework — Variation 1 to the Land and Water Regional Plan — now has legal effect and supports actions being undertaken within the Te Waihora wider work programmes.
- Variation 1:
  - Introduces catchment limits for losses of nitrogen from farming activities and point source discharges (community sewage and industrial processing activities).
  - Sets limits on abstraction and minimum flows on rivers and streams,
  - Seeks to reduce allocation from ground water over time, and prohibits new takes.

**from 2010**
Implement actions to prevent further loss of ecosystem health in river mouths and coastal lagoons.

**by 2015**
Accelerate the current riparian restoration and management programme for Te Waihora/ Lake Ellesmere and tributary streams.

**from 2020**
A significant protection and restoration programme is in place on the most ecologically significant river mouth or coastal lagoon in each management zone.

**from 2040**
Examples of thriving coastal lagoons and lowland or spring-fed ecosystems in each water management zone.
Water quality in lowland areas is typically poorer than in high country areas. This is shown by the WQI for lower hill-fed and spring-fed streams (2.3d-f). In general, this is because of the greater intensity of land use in the warmer, flat low country. An additional factor is the accumulation of contaminants in groundwater, which re-emerges in lowland streams.

Spring-fed streams tend to meander through farms, which are susceptible to both localised and diffuse contaminant sources. These streams show the greatest variation in water quality.
Chapter 2: Ecosystem Health and Biodiversity

LOWLAND STREAMS

Lowland streams and rivers have lower ecosystem health and habitat quality than those in the high country as they are impacted by multiple stressors. These include low flows, habitat degradation and declines in water quality due to diffuse discharges of agricultural and urban contaminants. Actions are underway at numerous sites catchment-wide to effect change in land use management that will support all waterways.

from 2010
Identify and prioritise protection for lowland streams ecosystems in each zone.

by 2015
▼ Target 1: Protect and enhance the ecological health of the best examples of lowland streams ecosystems in each zone.
▼ Target 2: Improve ecosystem condition in at least another 10% of lowland streams in each zone.

from 2020
Improve condition and water quality in at least 60% of lowland streams and 60% of lowland lakes in each zone.

by 2040
100% of lowland areas and spring-fed streams with at least good aquatic ecosystem health, or showing an upward trend.

INDICATORS
Number/location of lowland streams ecosystems identified for restoration/protection.

Figure 2.4: Aquatic Ecosystem Health (AEH) Grade of Lowland and High Country Streams

Aquatic Ecosystem Health monitoring is carried out annually in spring/early summer, at around 200 sites throughout Canterbury. Streams are chosen to represent the full range of waterways in the region: alpine, lowland, spring-fed and hill-fed. Ecosystem health is determined according to the number and types of aquatic organisms present at a site. The score for each stream type is standardised against the score from a reference, or ‘best available’, site to control for natural variability — such as climate — which affects all streams.

Progress

» Zone committees are identifying priority areas according ecological and cultural rankings.
» By 2015, Immediate Steps has allocated $420,000 to 29 sites across Canterbury.
» Ecosystem health, habitat and water quality is being monitored by Environment Canterbury throughout the region (see Box 3 on page 19).
» Lowland streams and rivers have low Aquatic Ecosystem Health scores. Around 30% of lower hill-fed streams and 67% of spring-fed streams on the plains are in poor condition (fig2.4b).
» The Water Quality Index (See Box 3 on page 19) indicates that around 40% of lowland streams are in poor or very poor condition.
» There are currently six monitoring sites in urban streams. Two sites have very poor AEH grades, three have poor grades and one has a good AEH grade.
HIGH COUNTRY AND FOOTHILL STREAMS

Water quality in the high country is variable among river types, predominantly influenced by sediment inputs and associated contaminants. Aquatic ecosystem health and water quality is typically higher than in lowland streams, particularly for streams that receive a large volume of flow from higher up in the catchment.

Progress

- By 2015, Immediate Steps has allocated $650,000 to 36 sites in high country and intermontane streams.
- The Aquatic Ecosystem Health (AEH) monitoring programme measures stream health at 27 high country sites with a score given according to the diversity of invertebrates present.
- Smaller high country rivers and streams have variable aquatic ecosystem health and water quality, depending primarily on the intensity of land use along their banks (see figure 2.3b and 2.4e).
- Spring-fed streams in the high country are particularly vulnerable to habitat degradation and siltation through stock access and runoff from intensive land use (see figure 2.3e and 2.4f).
- The Water Quality Index (See Box 3 on page 19) indicates that around 50% of high country and foothill streams are in good or very good condition.
- New planning rules have been established, which means all intensively farmed livestock are prohibited from natural waterways.

by 2015
Highlighted any high country spring-fed or foothill streams where ecosystem health is declining, and identified the cause with an action plan in place.

from 2020
All foothill rivers and high country rivers and/or lakes either in good ecological health or better, or showing upward trends.

by 2040
Maintained upland spring-fed streams and lakes in very good aquatic ecosystem health (no decline from 2010). 80% of other rivers/streams and lakes with very good aquatic ecosystem health.

INDICATORS
Positive trends in aquatic ecosystem health for high country/foothill streams and lakes, including the proportion with very good ecosystem health.
UNDERSTANDING EMERGENT CONTAMINANT RISKS
The quality of ecosystem health and biodiversity depend on the management of contaminants and land-use in catchments. Environment Canterbury has several monitoring programs that measure changes in water quality and ecosystem health, with site-specific investigations which are conducted when contamination is suspected or identified. This means risk areas can be identified and managed.

by 2015
Understood any emerging contaminant risks and identified any at-risk areas for targeted management.

by 2040
Understood any emerging contaminant risks and identified any at-risk areas for targeted management.

INDICATORS
Number and location of new contaminant risk areas for management, identified by water body and by contaminant type.

Progress

- Ongoing research is being conducted by multiple partners to determine the effects of chemicals on the environment.
- Environment Canterbury and local councils are identifying land uses that may contaminate land through a Hazardous Activities and Industries List (HAIL). This information is used to better understand the risks to groundwater and surface water from contaminated or potentially contaminated sites.
- Environment Canterbury scientists have helped develop national guidelines for acceptable levels and are helping to develop and trial environmentally sensitive technologies for the removal of fine sediment from streams.
- Environment Canterbury are testing for contaminants during investigations based on potential presence and require strict monitoring as part of consent conditions during construction, maintenance or remediation of potentially contaminated sites.
- There are strict rules incorporated in the LWRP for handling hydrocarbons around water bodies.
- Environment Canterbury have produced user-friendly guidance for the building industry and have developed innovative approaches to monitoring and mitigating the effects of discharges.
ENVIRONMENTAL FLOWS

by 2015
Identified areas where catchment load limits for nutrients are not met, prioritised areas and implemented actions to ensure there is no further enrichment.

Demonstrated, and included in implementation programmes, how land within the zone will be managed to achieve catchment load limits.

Achieved nutrient efficiency targets for the zone on all new irrigated land and 50% of other rural properties (and of properties within urban boundaries that apply nutrients over significant areas).

from 2020
Achieved nutrient efficiency targets for the zone on all new irrigated land and 80% of other land in major rural land uses (pasture, major arable and major horticulture crops), and have 100% of rural properties working towards those targets (and properties within urban boundaries that apply nutrients over significant areas).

by 2040
Achieved nutrient efficiency targets for the zone on all new irrigated land and 100% of other rural properties (and properties within urban boundaries that apply nutrients over significant areas).

INDICATORS
Reported under the “Drinking water” target, see page 32.

The progress of both of these target is reported under the “Environmental Limits” target, see page 8.

CATCHMENT NUTRIENT LOADS

by 2015
Identified where environmental flows are not met or require change to meet ecosystem health and biodiversity outcomes and implemented actions to rectify.

from 2020
Made progress towards achieving environmental flow and catchment load limits.

by 2040
Achieved all environmental flow and catchment load limits.

INDICATORS
- Number/location of streams and rivers with environmental flows/allocation limits in place, and where environmental flows maintain ecosystem health.
- Positive trends in surface water quality, and aquatic ecosystem health, for rivers and streams.
Chapter 3: Natural Character of Braided Rivers

BRAIDED RIVER CHARACTER

Braided rivers are iconic features of the Canterbury landscape. The braided river floodplain or braidplain comprises both the active channels, less recently disturbed islands and lateral areas with more mature vegetation. The active riverbed includes the network of braided channels, islands and river margins that are inundated during flood events. There are a number of programmes underway to assist with maintenance of the braided rivers.

from 2010
Maintain the braided character of all Canterbury’s braided rivers by:

- Target 1: Maintaining the upper catchments of Canterbury’s alpine braided rivers as largely natural ecosystems and landscapes.
- Target 2: Maintaining the extent of active floodplains, flow variability and sediment flow processes including when undertaking river protection works, land-use change or deliberate vegetation stabilisation.
- Target 3: Supporting the dynamics of river mouths and coastal processes.
- Target 4: No new dams on the main stem of major alpine braided rivers.

by 2040
Canterbury’s braided rivers show the dynamic, braided nature typical of such rivers.

INDICATORS
- Area of upper braided river catchments in natural ecosystems.
- Area of active braided river beds compared with baselines.
- Number of new dams on the main stem of major alpine braided rivers.

Progress

T1 ▼ T2 ▼ T3 ▼ T4 ▼ Started Progress Good Progress Achieving

Target 1:
- Monitoring using satellite imagery and aerial photographs shows extensive development of lowland plains braided river margins over recent decades.
- Since 1990 12,000 ha of formerly forested or undeveloped braided river margins land on the plains has been converted to intensive agricultural use.
- A similar pattern of development is now underway in high country valleys. Extending the monitoring into the upper catchments would help quantify land use change in high country areas.

Target 2:
- Flow variability for floodplain morphodynamics is now routinely considered in the planning process and the assessment of consent applications to abstract water or dam a river.
- Flood flows and flow variability are critical components of any flow and allocation regime. Flows are monitored on braided rivers in the region with the data used to assess the potential impacts of proposed changes on each river.
- Environment Canterbury manage flood defense work and gravel extraction considering potential impacts of changes to channel morphology, vegetation cover and sediment supply.

Target 3:
- As of 2015 Environment Canterbury’s monitoring has indicated only natural variability in the dynamics of river mouths and coastal processes.
Environmental flows

The biodiversity and natural character values of braided rivers are the result of the interplay between frequent, large floods and the supply of sediment to the rivers. Activities that effect flooding and sediment supply can be detrimental to these rivers. Assessing environmental flows involves maintaining the annual pattern of flows that support aquatic ecosystem health and biodiversity of braided river environments. Environment Canterbury monitors and sets flows to support the natural character of braided rivers.

Progress

<table>
<thead>
<tr>
<th>Target 4:</th>
<th>Not Started</th>
<th>Started</th>
<th>Progress</th>
<th>Good Progress</th>
<th>Achieving</th>
</tr>
</thead>
<tbody>
<tr>
<td>» Damming of water in riverbeds of alpine rivers is prohibited under the Canterbury Land and Water Regional Plan.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>» Various rules apply, from permitted to prohibited activity, for damming or impoundments of water under the Hurunui and Waiau River Regional Plans.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>» Existing policies still apply under the Canterbury Natural Resources Regional Plan (NRRP, WQN1) until the Proposed Canterbury Land and Water Regional Plan is fully operative.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

ENVIRONMENTAL FLOWS

from 2010
Identify and prioritise for protection lowland streams ecosystems in each zone.

by 2015
Identified where environmental flows do not include flood peaks, flow variability, flood periodicity, and channel forming flows and implemented actions to rectify.

from 2020
Made progress towards achieving environmental flows.

by 2040
Achieved all environmental flows.

INDICATORS

Braided rivers with environmental flows regimes in place, and where environmental flows maintain ecosystem health.

» All recent environmental flow regimes in Canterbury have been developed with planning provisions in mind and consideration of flow variability and channel morphology to support ecosystem health.

» Environment Canterbury is recording water levels at 129 sites including all major waterway types in the region. Flow assessment figures are used to determine what, if any, restriction on the taking of water is to be applied. This may result in a percentage reduction in the rate or volume of the take, or a requirement to cease abstraction altogether.
Chapter 3: Natural Character of Braided Rivers

ECOSYSTEMS, HABITATS & SPECIES

**Braided gravel bed rivers have considerable biodiversity value and are an iconic part of the Canterbury landscape. Their riverbeds, riparian margins, floodplains and associated wetlands and springs support many of the region’s endangered and rare species. Partners are working to support this.**

**RIPARIAN WETLANDS, SPRINGS & LAGOONS**

**Progress**

- Geographical focus of Immediate Steps in Rakaia and Rangitata Rivers where some of Canterbury’s threatened bird species are concentrated on:
  - Maintaining and restoring populations of threatened species by controlling pest animals;
  - Restoring and enhancing terrestrial breeding habitats using weed control

- A five-year programme to trap predators of Black-Fronted Terns is starting at three breeding colonies beside the upper Clarence River (Molesworth Station). The programme is also clearing broom and willows from islands where terns breed. The Kaikoura Zone Committee will invest $90,000, Environment Canterbury will invest $184,000 through its Canterbury Braided River Initiative and the Department of Conservation will invest $240,500.

**from 2010**

Implement actions to correct the decline in usable braided river bird habitat.

**by 2015**

Enhance and protect breeding populations of indigenous braided river birds.

**from 2020**

Protect significant habitat for a full range of indigenous braided river flora and fauna.

**by 2040**

- All indigenous braided river-dependent species showing positive trends in abundance and health.
- Increased habitat area usable by all species of braided river indigenous birds.

**Progress**

- Environment Canterbury programme established to address the regional-level and long-term strategies for braided river management.

- One in three Immediate Steps projects are dedicated to braided rivers, and the number of initiatives to undertake conservation work within braided rivers has increased.

- Maintaining flow regimes that protects braided river habitat, biodiversity and threatened species
**MARAЕ WATER SUPPLY**

*Ensuring good quality drinking water at the marae is an important Kaitiakitanga target. Since 2010, one of the Papatipu Rūnanga marae has achieved fully compliant water supply.*

» Collaborative actions taken by rūnanga, Community Health Boards, and Environment Canterbury to improve access to quality drinking water and achieve compliance include:
  » registering water supplies that allows access to free Ministry of Health technical, engineering and water supply advice.
  » developing Water Safety Plans and investigating emergency response needs.
  » connecting to a reticulated supply where it exists
  » upgrading water supplies and water treatment systems.

» Seven of the 13 Canterbury marae draw from their community water supplies. Of these seven, two supplies are non-compliant. The other six marae are on their own water supply. Of these six, three are non-compliant and three supplies are unknown. All marae are working with Community Public Health to maintain or improve their drinking water quality.

<table>
<thead>
<tr>
<th>Marae</th>
<th>Water Supply</th>
<th>Zone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mangamaunu</td>
<td>Own supply</td>
<td>K</td>
</tr>
<tr>
<td>Takahanga</td>
<td>Kaikōura Town</td>
<td>K</td>
</tr>
<tr>
<td>Tuahiti</td>
<td>Own supply</td>
<td>W</td>
</tr>
<tr>
<td>Ngā Hau e Wha</td>
<td>Christchurch City</td>
<td>C-W</td>
</tr>
<tr>
<td>Rehua</td>
<td>Christchurch City</td>
<td>C-W</td>
</tr>
<tr>
<td>Rapaki</td>
<td>Christchurch City</td>
<td>BP</td>
</tr>
<tr>
<td>Tutuwharewa, Koukourārata Marae, Port Levy</td>
<td>Own supply</td>
<td>BP</td>
</tr>
<tr>
<td>Wairewa</td>
<td>Little River</td>
<td>BP</td>
</tr>
<tr>
<td>Onuku</td>
<td>Own supply</td>
<td>BP</td>
</tr>
<tr>
<td>Ngāti Moki Taumutu</td>
<td>Own supply</td>
<td>S-W</td>
</tr>
<tr>
<td>Hakatere</td>
<td>Fairton</td>
<td>ASH</td>
</tr>
<tr>
<td>Arowhenua</td>
<td>Own supply</td>
<td>OOP</td>
</tr>
<tr>
<td>Waihao</td>
<td>Lower Waihao</td>
<td>LW</td>
</tr>
<tr>
<td><strong>Fully Compliant / Community or Own supply</strong></td>
<td><strong>Non-compliant Own supply</strong></td>
<td><strong>Non-compliant Community supply</strong></td>
</tr>
</tbody>
</table>

Table 4.1 Canterbury marae drinking water supplies
Chapter 4: Kaitiakitanga

WORKING TOGETHER IN PARTNERSHIP

Since signing the Tuia Relationship Agreement between Ngā Papatipu Rūnanga and Environment Canterbury in December 2012, the nature and extent of the relationship continues to grow and develop. Investing in the relationship by bringing capacity and capability to bear ensures all parties continue to move closer to achieving partnership in the management of the region’s natural, physical and freshwater resources. The cultural values return from mana whenua engagement and participation in the CWMS collaborative process will continue to be challenged by the inevitably slow and incremental pace of any real or tangible improvement at the flax roots in terms of mahingā kai and customary use.

from 2010
Formally recognise Te Rūnanga o Ngāi Tahu Freshwater Policy and, in each zone, work towards resolving issues related to Ngāi Tahu policies on:
- Environmental flows that afford protection to instream values,
- Direct discharge to point source contaminants to water,
- The unnatural mixing of water sourced from different water bodies,
- Addressing non-point source pollution through a range of measures including regulatory control.

by 2015
▼ Target 1: Protocols for the recognition and exercise of mana, including kaitiakitanga within the Ngāi Tahu rohe, are implemented.
▼ Target 2: Iwi Management Plans (IMP) in place for all zonal areas.
▼ Target 3: Institutional capability within local government to adequately recognise and provide for the principle of kaitiakitanga in water management.
▼ Target 4: A formal co-governance arrangement (developed in partnership by Ngāi Tahu, the Crown and Canterbury local government) for the active management of Te Waihora (Lake Ellesmere) and its catchment.
▼ Target 5: A system for appointing Ngāi Tahu tangata tiakiwai (water guardians) who have formal recognition and support from local government is established.

Progress

» Target 1: Protocols for the recognition and exercise of mana within the Ngāi Tahu rohe have not been formally developed, though many informal protocols and processes have been established via the Ngāi Tahu/Environment Canterbury and CWMS Zone Committees.
» Target 2: Iwi Management Plans (IMP) are in place for the northern and middle of the region and work is currently underway to develop an IMP for the Waitaki catchment, which will extended to the rest of South Canterbury.
» Target 3: “Tuia”, the Ngāi Tahu and Environment Canterbury Joint Work Programme, is being implemented and involves changes in organisational culture, processes and engagement practices to improve relations and interaction with Ngāi Tahu, and support integration of improved working practices across Environment Canterbury
» Target 4: Whakaora Te Waihora is a joint programme of work between Environment Canterbury, Te Rūnanga o Ngāi Tahu, the Ministry for the Environment and Papatipu Rūnanga. A formal co-governance arrangement – Mahere Tukutahi o Te Waihora – is a joint land management plan and new approach to natural resource management in Canterbury that acknowledges and brings together the tikanga responsibilities of Ngāi Tahu and the statutory responsibilities of Environment Canterbury (see page 18).
Target 5: A system for appointing Ngāi Tahu tangata tiakiwai (water guardians) is not yet in place.

Ngā rūnanga are represented on each zone committee and supported by two tangata whenua facilitators. Te Rūnanga o Ngāi Tahu has now increased representative’s capability and capacity by providing IT devices and training, administrative and technical support. Further, a significant increase in resources supporting representatives working in the freshwater space is planned for in the coming 2015/16 financial year.

Kaikoura Environmental entity is due to come on line and will provide additional capability and capacity in support of representatives. A similar entity is planned for in the South Canterbury region.

Feedback from rūnanga representatives signals strong support for their role in being ‘at the table’ in water management issues.

**from 2020**
Further co-governance arrangements (developed in partnership by Ngāi Tahu, the Crown and Canterbury local government) for the active management of nominated waterbodies in North and South Canterbury.

Integrated Ki Uta Ki Tai environmental management philosophies into zonal and regional management planning.

At least one Ngāi Tahu tangata tiakiwai is appointed within each zone.

**by 2040**
Kaitiakitanga is a normalised and an integrated practice of water management.

**INDICATORS**
- Change in understanding/zone of customary values and uses.
- Change in type/number activities to increase understanding about customary values and uses.
- Involvement of Papatipu Rūnanga in Immediate Steps/year.
- Processes and work programmes underway for formal recognition of Te Rūnanga o Ngāi Tahu Fresh Water Policy.
- Progress on development/implementation of protocols for recognition and exercise of mana.
- Change in number of Iwi Management Plans/zone.
- Change in local government capability to recognise and provide for kaitiakitanga.
- Change in number/type of activities undertaken to increase institutional capability to recognise and provide for kaitiakitanga.
- Formal co-governance arrangement for Te Waihora and other waterbodies.
- Progress on development of/implementation of Tangata Tiakiwai appointment system.
Chapter 4: Kaitiakitanga

WĀHI TAONGA AND MAHINGA KAI

*Kaitiakitanga* is about the active protection, sustainable use and responsibility for freshwater bodies and their related natural and physical resources by tangata whenua. Active participation of Papatipu Rūnanga in CWMS activities and decision-making is pivotal to success. Iwi Management Plans, co-governance of environmental resources and restoration of mahinga kai and wāhi taonga are pioneering examples of shared governance and management responsibilities between Ngāi Tahu and Environment Canterbury.

<table>
<thead>
<tr>
<th>Progress</th>
<th>T1</th>
<th>T2</th>
<th>T3</th>
<th>T4</th>
<th>T5</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

**from 2010**
Prevent further loss or degradation of Ngāi Tahu nominated wāhi taonga.

**by 2015**
- Target 1: All degraded wāhi taonga and mahinga kai waterways nominated by Ngāi Tahu have an active restoration programme in place that responds to cultural priorities.
- Target 2: A report on the health of all Ngāi Tahu nominated water-bodies using the Ngāi Tahu Cultural Health Monitoring Tool.
- Target 3: Identified customary uses (current and potentially restored) for all waterways.
- Target 4: A programme for identifying cultural preferences for river and stream flow agreed in each zone.
- Target 5: Work and research has commenced on establishing a mahinga kai food gathering standard.

**from 2020**
Increased the abundance of, access to and use of mahinga kai.

A mahinga kai food gathering standard is confirmed and implemented as a water quality monitoring tool.

» Target 1: Involvement of Papatipu Rūnanga continues through various community, Te Rūnanga and Zone Committee initiated projects and programmes to restore degraded waterways and wāhi taonga sites.

» Highlights of projects to restore waterways and wāhi taonga sites include work carried out at Wainono Lagoon, Te Waihora, Koukourārata, Tutaepatu Lagoon, Oaro River, Awarua Creek/Arowhenua that involve collaboration between Te Rūnanga o Ngāi Tahu, Papatipu Rūnanga, Environment Canterbury, the Department of Conservation and other parties.

» Target 2.3: Cultural Opportunity Mapping and Assessment (COMA) has been undertaken in nine catchments (see table 4.2).

» Target 4: The cultural monitoring of mahinga kai is a key project co-delivered by Whakaora Te Waihora and the National Institute of Water and Atmospheric Research (NIWA). The project focuses on protecting, rehabilitating, and enhancing mahinga kai in Te Waihora, with four key project strands:

» Monitoring the relative abundance of tuna (eel), pātiki (flounder) and inanga (whitebait) at the lake and tributaries.
Quality of mahinga kai - Lake Cultural Health Index questionnaire for customary users

- Monitoring mahinga kai safety, testing tuna, pātiki, ducks, and aua (yellow-eyed mullet) for heavy metal and pesticides.

- Distribution of declining mahinga kai species waikōura (freshwater crayfish) and waikākahi (freshwater mussel) in the focus catchments and additional lowland waterways.

Target 5: Planning work has begun for preparation of a mahinga kai food gathering standard. This requires multiple agency involvement e.g. Environment Canterbury, Te Rūnanga o Ngāi Tahu, Canterbury District Health Board, Ministry of Primary Industries, Department of Conservation, Papatipu rūnanga, National Institute of Water and Atmospheric Research.

<table>
<thead>
<tr>
<th>Waterway(s)</th>
<th>Zone</th>
<th>Start Date</th>
<th>Completed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ashley River</td>
<td>WAI</td>
<td>2013</td>
<td>Yes (Draft), 2014</td>
</tr>
<tr>
<td>Selwyn Te Waihora Catchment</td>
<td>S-W</td>
<td>2011</td>
<td>Yes</td>
</tr>
<tr>
<td>Ashburton/Hakatere River</td>
<td>ASH</td>
<td>2011</td>
<td>Yes (interim)</td>
</tr>
<tr>
<td>Hinds Plains</td>
<td>ASH</td>
<td>2012</td>
<td>Yes</td>
</tr>
<tr>
<td>Orari River Catchment</td>
<td>OOP</td>
<td>2009</td>
<td>Yes, 2012</td>
</tr>
<tr>
<td>Opihi River Catchment</td>
<td>OOP</td>
<td>2011</td>
<td>Yes</td>
</tr>
<tr>
<td>Waihao River and Wainono Lagoon Catchment</td>
<td>LW</td>
<td>2011</td>
<td>Yes</td>
</tr>
<tr>
<td>Northern Streams (Makikihi, Otaio, Kohika and Horseshoe Bend Creek)</td>
<td>LW</td>
<td>2013</td>
<td>Yes</td>
</tr>
<tr>
<td>Waitaki catchment</td>
<td>UW</td>
<td>2014</td>
<td>Yes, 2015</td>
</tr>
</tbody>
</table>

Table 4.2: Cultural opportunities mapping assessments completed since 2010 in association with the development of plans for flows, allocation and water quality.

by 2040
Protection, in accordance with Ngāi Tahu values and practices, of wahi taonga and mahinga kai waterways.

**INDICATORS**
- Change in number and type of restoration programmes, reports on health of wahi taonga and mahinga kai waterways, and places where customary uses have been identified for waterways.
- Progress on programme for identifying cultural preferences for flow/zone.
- Progress on mahinga kai food gathering standard.
- Change in the abundance of, access to and use of mahinga kai by Ngāi Tahu nominated waterways.
Chapter 5: Drinking Water

SOURCE WATER QUALITY

The quality and quantity of drinking-water supplies depends on the management of point sources and non-point sources of contaminants in drinking-water supply catchments and aquifers, land-use in the catchment and/or recharge area, and on the treatment provided by the local authority. Actions to protect drinking water differ for groundwater from a secure source and surface water sources. The percentage of the region’s population with access to safe drinking-water is high, but there are numerous smaller water supplies supplying smaller communities that are non-compliant.

by 2015

For those communities that currently have access to untreated and safe drinking water, implement actions to ensure the source water quality remains high enough to meet the current Drinking Water Standards for New Zealand (DWSNZ) without treatment.

Prevent further decline in source water quality for those communities that currently have to treat drinking water, such that this requires increased level of treatment or monitoring requirements.

No new activities in a drinking water catchment that reduce access to sufficient quantities of drinking water supplies.

from 2020

There is an increase in the percentage of the population supplied with water that meets the (DWSNZ) for health based determinants.

INDICATORS

• Compliance of registered Canterbury community water supplies with DWSNZ.

Progress

» Territorial Authorities are undertaking actions to ensure source water quality remains high and distribution systems supply water that meets Drinking Water Standards for New Zealand (DWSNZ).

» Since 2009, more than 140 recommendations have been made in Zone Implementation Programmes (ZIPs) to set catchment load limits and improve nutrient management specifically to protect drinking water.

» Projects underway include monitoring the quality of drinking water sources and reducing the impact of agriculture on water quality, the establishment of catchment groups to drive local ownership of water issues, and in urban areas, collaboration with city councils to monitor water quality and enhance urban streams.

» Figure 5.1 shows compliance of registered Canterbury community water supplies;

  » Eleven water supplies in the region have achieved DWSNZ compliance since 2011/2012;

  » eight Water supplies have lost DWSNZ compliance since 2011/2012,

  » Three supplies have lost their ground water security status due to transgressions in the source water quality,

  » Three bores have been retired due to nitrate, salinity and turbidity issues.
• Continued action taken to ensure;
  • Source water quality remains high enough to meet DWSNZ without treatment,
  • Source water quality does not decline further for water supplies that currently have to treat drinking water,
  • Distribution systems supply water that meets DWSNZ.
• No new activities in catchments reduce access to drinking water supply.

Figure 5.1: Regional Compliance with Drinking Water Standards of New Zealand
Chapter 5: Drinking Water

EMERGING CONTAMINANT RISK

Managing emerging contaminants is fundamental to ensuring safe drinking water. District health boards, Environment Canterbury, territorial authorities and water suppliers are conducting ongoing monitoring and reporting, are implementing and enforcing catchment load limits and are working with communities to improve water quality.

EMERGING CONTAMINANT RISK

Environment Canterbury is collecting groundwater samples from approximately 250 wells annually to assess the general quality of groundwater. Nitrate nitrogen and faecal contamination are the most common health-related contaminants with a health-based Maximum Acceptable Value (MAV) established for drinking water (Figure 5.2).

Environment Canterbury monitors pesticides and hydrocarbon contaminants in some parts of the region, and conducts more detailed investigations in specific areas where contamination has been detected. Results are used to assist Canterbury Public Health to implement and evaluate communicating potential risks with the community.

Remedial programmes are underway in Canterbury for nitrates in groundwater.

Figure 5.2 Comparison of 2013 annual groundwater survey results with drinking-water standards

 Progress

by 2015
Emerging contaminant risks are understood and any at risk areas identified for targeted management, and a remedial programme underway.

2020 onwards
Emerging contaminant risks are understood and any at risk areas identified for targeted management, and a remedial programme underway.

INDICATORS
Number and location of contaminant risk areas identified by water body and contaminant type(s) and with remedial programmes in place.
CATCHMENT NUTRIENT LOAD

Intensification of land use has necessitated the need to set catchment loads, limiting the amount of nitrate and phosphate that can be leached or discharged from farmland. Environment Canterbury continues to monitor water surface quality and groundwater flows to improve understanding of risks to drinking and recreational water quality and make this information publicly available. Work continues with water supply and health authorities and CWMS committees to meet a range of outcomes including the CWMS drinking water targets.

Progress

» Refer to ‘Environmental Limits’ chapter, page 8.

by 2015

Target 1: Set catchment load limits for nitrate consistent with drinking water quality targets for each zone, identified priority areas where targets are not met and implemented actions to ensure there is no further enrichment.

Target 2: Demonstrated, and included in implementation programmes, how land within the zone will be managed to achieve catchment load limits.

from 2020

Achieved nutrient efficiency targets for the zone on all new irrigated land and 80% of other land in major rural land uses (pasture, major arable and major horticulture crops), and have 100% of rural properties working towards those targets (and properties within urban boundaries that apply nutrients over significant areas).

by 2040

Average annual nitrate levels in all groundwater wells in Canterbury are below 50% of the maximum allowable value for drinking water.

Nitrate levels in community drinking wells are below the maximum allowable value of drinking water.

Achieved nutrient efficiency targets for the zone on all new irrigated land and 100% of other rural properties (and properties within urban boundaries that apply nutrients over significant areas).

INDICATORS

- Location of priority areas where load limits for nutrients are not being met, and actions being taken.
- Number of Canterbury Water Management Strategy Implementation Programmes that include recommendations for land management to achieve catchment load limits and change in type and location of actions underway.
Canterbury’s rivers and lakes are highly prized for recreation and used throughout the year by locals and visitors. Recreational and amenity opportunities provide social, cultural, health and economic benefits. CWMS Zone Committees have identified actions and desired outcomes for recreational opportunities and information is being gathered to advance work programmes to support recreation targets.

WATER BASED RECREATIONAL OPPORTUNITIES

A regional committee working group has been established to further work programmes on the availability and diversity of recreational sites within the region.

A completed report is available on kayaking values in the region and work is underway for jet-boating values and flows.

Recreational values have informed the Zone Committee’s advice on sub-regional planning.

Information is being gathered on recreational opportunities across Canterbury.

Zone Implementation Programmes identify actions and desired outcomes for recreational opportunities in their zone, including:

- enhancing sport fishery opportunities,
- supporting flow regimes that prevent river mouth closures and maintain recreationally attractive river mouths,
- environmental flows suitable for kayaking, jet boating and other recreational water sports,
- ensuring key swimming and recreation areas are included in seasonal monitoring.

from 2010
Maintain existing diversity and quality of water based recreation sites, opportunities and experiences

by 2015 /by 2020
A positive trend in the availability and/or quality of recreational opportunities in each zone.

by 2040
Restored at least one major fresh water recreational opportunity in each zone that is not currently available in 2010.

INDICATORS
- Change in the location and number of water based recreational sites (by water body/activity type) in each zone.
- Change in quality of water-based recreational experiences at selected recreational sites in each zone.

Progress

<table>
<thead>
<tr>
<th>Not Started</th>
<th>Started</th>
<th>Progress</th>
<th>Good Progress</th>
<th>Achieving</th>
</tr>
</thead>
</table>

» A regional committee working group has been established to further work programmes on the availability and diversity of recreational sites within the region.

» A completed report is available on kayaking values in the region and work is underway for jet-boating values and flows.

» Recreational values have informed the Zone Committee’s advice on sub-regional planning.

» Information is being gathered on recreational opportunities across Canterbury.

» Zone Implementation Programmes identify actions and desired outcomes for recreational opportunities in their zone, including:

- enhancing sport fishery opportunities,
- supporting flow regimes that prevent river mouth closures and maintain recreationally attractive river mouths,
- environmental flows suitable for kayaking, jet boating and other recreational water sports,
- ensuring key swimming and recreation areas are included in seasonal monitoring.
Information on angler usage of lake and river fisheries is managed by Fish & Game NZ. Results from the 2014/15 National Angling Survey were not available at the time of publishing. The survey will be the fourth comprehensive national survey commissioned by Fish & Game NZ. Previous surveys were conducted in 1994/95, 2001/02 and 2007/08.

Work is underway to identify flows that would help maintain or enhance recreational values. A report is available for kayaking flows and work is underway for jet-boating flows.

» Refer to 'Environmental Limits' chapter, page 8.

Different recreational activities, interests, and users require different flows at different times. Some require a wilderness experience; others need white-water conditions or safer flows and tranquil places.

Progress

» Work is underway to identify flows that would help maintain or enhance recreational values.

A report is available for kayaking flows and work is underway for jet-boating flows.

» Refer to ‘Environmental Limits’ chapter, page 8.

Freshwater angling is a popular recreational activity in Canterbury rivers with brown trout, rainbow trout and Chinook salmon a sought-after catch. Smaller, localised fisheries also exist for other introduced salmonids.

Progress

» Information on angler usage of lake and river fisheries is managed by Fish & Game NZ. Results from the 2014/15 National Angling Survey were not available at the time of publishing. The survey will be the fourth comprehensive national survey commissioned by Fish & Game NZ. Previous surveys were conducted in 1994/95, 2001/02 and 2007/08.
RECREATIONAL WATER QUALITY

The recreational water quality monitoring programme follows the national guidelines for marine and freshwater recreational areas, assessing the microbiological quality of water bodies and associated health risks to water users. Monitoring is conducted in the summer seasons at popular river and lake bathing sites throughout Canterbury.

by 2015
At least 80% of river bathing sites graded as suitable for contact recreation.

by 2020
Of the lake and river sites used for contact recreation, an increase in the percentage that meet recreational water quality guidelines.

INDICATORS
Change in the percentage and number of lake and river bathing sites graded as suitable for contact recreation.

» The Recreational Water Quality monitoring programmes assesses the general condition of a site at any given time in relation to recreational water quality (see Box 4). Sites graded ‘very good’, ‘good’ and ‘fair’ are considered suitable for contact recreation; sites graded ‘poor’ and ‘very poor’ are considered unsuitable (Figure 6.3).

» This report has recast data available since 2009 across consistent recreation sites. Results show a decrease in recreational water quality, with 67% of river bathing sites graded as suitable for contact recreation in the 2013/14 monitoring period compared to 74% in 2009/10 (Figure 6.1).

» The general condition of lake sites for contact recreation are higher, with 88% of lake sites considered generally suitable for contact recreation in the 2013/14 monitoring period (Figure 6.2).

Progress

- The Recreational Water Quality monitoring programmes assesses the general condition of a site at any given time in relation to recreational water quality (see Box 4). Sites graded ‘very good’, ‘good’ and ‘fair’ are considered suitable for contact recreation; sites graded ‘poor’ and ‘very poor’ are considered unsuitable (Figure 6.3).

- This report has recast data available since 2009 across consistent recreation sites. Results show a decrease in recreational water quality, with 67% of river bathing sites graded as suitable for contact recreation in the 2013/14 monitoring period compared to 74% in 2009/10 (Figure 6.1).

- The general condition of lake sites for contact recreation are higher, with 88% of lake sites considered generally suitable for contact recreation in the 2013/14 monitoring period (Figure 6.2).
Recreational Water Quality

MONITORING PROGRAMME: Recreational Water Quality

Suitability for Contact Recreation
The recreational water quality monitoring programme follows the national guidance provided by the Microbiological Water Quality Guidelines for Marine and Freshwater Recreational Areas (MfE & MoH, 2003). These guidelines address the microbiological quality of water bodies and associated health risks to water users. A grade is based on the risk of faecal contamination to a site, supported by water testing for faecal indicator bacteria.

Cyanobacteria
Swimming water quality grades do not cover toxic algal blooms including cyanobacteria that are widespread in many lakes and rivers. Cyanobacteria are found in a wide range of water quality conditions, including relatively ‘clean’ waters. Over the 2013-14 summer there were eight recreational sites that reached action mode, requiring warnings to be issued. Because affected sites can change, visit http://maps.ecan.govt.nz/WaterQuality/ for the latest sites warnings.

Figure 6.3: Suitability of Lake and River bathing Sites for Contact Recreation
Chapter 7: Water-use Efficiency

GENERAL

Irrigation efficiency improvements are being driven by the increasing need to improve reliability. Efficiency gains are also required through regional planning rules through which nutrient loss limits have been set across Canterbury through the LWRP and are being refined through localised planning rules over the coming years. Across Canterbury there has been widespread investment in more efficient irrigation systems with a move towards spray irrigation from the more traditional flood and/or micro irrigation systems. The performance of any irrigation system is dependent on achievement of best-practice in both the design and management of the system.

**INDICATORS**

- Definition of best-practice water use.
- Percentage of water used for irrigation and stockwater that is operating according to best-practice.

**Progress**

- Irrigation NZ has developed Irrigation Design Code of Practice and Standards which outline the required level of design to enable irrigators to achieve industry and wider community expectations.
- A National Certificate in Irrigation Design is available for irrigation designers covering the Irrigation Design Code of Practice providing an understanding of the tools required to achieve the required standards.
- Environment Canterbury actively promotes the installation of water meters throughout Canterbury. More than 92% of all water allocated across Canterbury where takes are 20l/s or more are now metered.
- Actual benchmarks of water use are not yet available. Good management practices are outlined within the industry agreed Good Management Practices, applicable to all farms in Canterbury by June 2017.

**from 2010**

No decline in the efficiency of water use

**by 2015**

Sixty of water used for irrigation is operating according to best practice water use.

**from 2020**

Eighty percent of water used for irrigation and stockwater is operating according to best practice water use.

**by 2040**

Implemented best practice water use on all irrigation, stockwater and industrial/commercial use in Canterbury.

Increased the benefits gained per unit of water so that the volume of water beneficially used (used in production of crops, electricity, or commercial uses) in each zone as a proportion of the volume of water taken is, on average, 25% greater than that achieved in 2010.

Reduced water used for community water supply by 20% (measured in litres per person per day) compared to that used in 2010.
**BENCHMARKING**

The RMA allows the taking and using of water for an individual’s reasonable domestic needs; or the reasonable needs of an individual’s animals for drinking water as long as there is no adverse effect on the environment as a result of taking and using water. Guidance on what is reasonable is provided from the Ministry of Health for an individual’s daily usage and industry sources for stock usage.

» Irrigation NZ has completed a study working with more than 40 Canterbury farms to develop production based benchmarks. Included in these benchmarks is consideration for reasonable and efficient use of water as measured by ‘crop per drop’.

» As water use data improves, it can be readily cross-referenced with information on irrigated land area, soil type and climate to produce farm-level estimates of efficiency and provide information for benchmarking.

» National Water Measurement and Reporting Quality Assurance Programme has been introduced by Irrigation NZ to align with the national regulations. This programme is being overseen by an independent Water Measurement Panel to ensure accredited service providers deliver equipment and services that comply with the regulations.

» The ‘Blue Tick’ has been introduced and promoted by Irrigation NZ to give irrigators confidence that their irrigation system design and installation complies with the Guidelines for the Measurement and Reporting of Water Takes 2014 and the Resource Management (Measurement and Reporting of Water Takes) Regulations 2010.

» Environment Canterbury has commissioned studies to provide estimates of irrigated areas and irrigation system types. When combined with climate data and water use data, it can provide region-wide estimates for use in benchmarking.

» There are 110 ZIP recommendations from the zone committees regarding improvements to domestic drinking water supply which are being folded into the work programmes of local councils.

» Christchurch city water consumption has been benchmarked against figures for major Australian cities.

» For stockwater, benchmarks have been established and are calculated as per Schedule WQN11 (NRRP).

**Progress**

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**INDICATORS**

- Benchmarks of current water use efficiency for irrigation, community (potable, industrial and commercial) and stockwater.
- Water use efficiency by irrigation, community (potable, industrial and commercial) and stockwater supply scheme, reported against current benchmarks.

**from 2010**

Initiate the development of models/ benchmarks of reasonable and efficient use of water in irrigation.

**by 2015**

Established and reported against a benchmark of current water use efficiency for irrigation, community (potable, industrial and commercial) and stock water.

**by 2020/2040**

No targets defined.

Water-use Efficiency
Chapter 8: Irrigated Land Area

LAND AREA AND RELIABILITY

The Canterbury Water Management Strategy sets an indicative target for 2040 of 850,000 ha of irrigated land with at least 95% reliability. Increasing irrigated area and reliability requires progress to be made in water management at a scheme level. This means, in some part, developing cooperative arrangements between the various water management interests, adopting improved management systems, improving the operation of existing infrastructure and the development capacity within these systems (small and medium scale storage). Irrigating more land builds resilience into the local economy making it less susceptible to both long-term climate change and short term dry spells.

from 2010
No reduction in irrigated land area in Canterbury or in overall reliability within each zone.

by 2015
Increased the area of irrigated land and/or reliability of irrigation.

from 2020
Improved reliability of supply for at least 50% of irrigated land.

by 2040
A substantial increase in the reliability of supply and the area of land irrigated in Canterbury all of which has demonstrated high standards of riparian, nutrient and water use management, and has been shown to be consistent with the principles of the strategy. An indicative target is 850,000 hectares of irrigated land with at least 95% reliability.

INDICATORS
- Potentially irrigable area, in each zone, and for the region (2010 as baseline).
- Area consented for irrigation, in each zone, and for the region (2010 as baseline).

Progress

Across Canterbury, reliability improvements are being sought through development of both storage and piping in new and existing schemes (see figure 8.2 for details). Examples include:
- Work to increase storage within the existing Waimakariri Irrigation Scheme of 8.2M m³,
- Further development of the Barrhill Chertsey Irrigation (BCI) Scheme which aims to improve their irrigated area and reliability of water supply,
- The piping of 88km of the Valetta Irrigation Scheme is complete, which will improve their irrigated area and reliability of water supply.
- The Mayfield Hinds scheme, which delivers water to 33,000 ha, is progressing with a number of enhancement projects to improve reliability including a storage facility and investigating piping opportunities to reduce on-farm pumping and conserve water loss from open irrigation channels,
- Ashburton Lyndhurst expect to complete their next pipeline by October 2015, with the remainder of their 30,000 Ha scheme piped by September 2017.
* Potential Irrigated Area is based only on known proposed infrastructure development. Current plus potential additional comes to 759,000 ha. Improved mapping of current irrigated area will provide more accurate figures.
**Chapter 8: Irrigated Land Area**

**INFRASTRUCTURE**

The CWMS identifies infrastructure as a means to contribute to all CWMS target areas, not just the supply of water for irrigation and hydro-electricity. Infrastructure can also address future-proofing issues such as ecosystem support in a changing climate and water quality management through enhanced reliability and distribution efficiency.

While CWMS is a collaborative process involving all councils across Canterbury, infrastructure development is based on cooperation and coordination while recognising the commercial goals of the parties involved. Infrastructure options are being considered and progressed with a vision for an integrated water infrastructure across Canterbury.

**by 2015**

A system of regionally distributed rural water infrastructure for the storage and distribution of water that provides reliable water to all irrigated land has been designed, timetabled, costed and staged.

The system has been demonstrated to align with the principles and targets of the strategy.

Decide mechanisms for funding infrastructure and the on-going operation of the strategy.

Started on the infrastructure (or reconfiguration of existing consents) that facilitates efficiency improvements and is linked into the regional storage plan.

Specified, for each zone, their infrastructure requirements consistent with the regional storage plan, and the principles and targets of the strategy.

**from 2020**

Started construction of regional storage and improved reliability of supply for at least 50% of irrigated land.

Started construction of infrastructure identified in zonal implementation programmes.

**INDICATORS**

Proportion of infrastructure recommended for development by CWMS committees that has been designed, timetabled, costed and staged, and demonstrated to align with the principles and targets of the CWMS.

**Progress**

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» The CWMS Regional Committee has considered and agreed on funding mechanisms for infrastructure.

» Environment Canterbury’s CWMS Infrastructure team continues to facilitate the development of a regional infrastructure solution that aligns with all the targets of the CWMS and the recommendations in the zone and regional implementation programmes.

» A Regional Distribution Model (RDM) has been completed and supports decision making across the Canterbury network. The model provides a systematic view of the interactions between climate, surface water, groundwater and water infrastructure.

» The ‘network’ approach to Canterbury’s water infrastructure has enabled multiple interests to identify new shared concepts that balance both economic (affordability) and environmental effects (nutrient loads). See figure 8.2 for more information.

» Component parts of South Canterbury and Hurunui infrastructure options still require further work.
Partners include Trustpower, Central Plains Water Ltd (CPWL), Barrhill Chertsey Irrigation (BCI) and the Rangitata Diversion Race Management Ltd (RDRML).

- Approval of the variation to the Rakaia River Water Conservation Order has allowed Trustpower to store, schedule and distribute consented water from Lake Coleridge to improve irrigation reliability. With this in place, irrigation partners BCI and CPWL have secured long term storage and release agreements with Trustpower, which provide an opportunity to improve reliability and expand irrigated area in Selwyn-Waihora and Ashburton Zones.
- CPWL construction is underway with Stage 1, supplying water for 23,000 ha, due for completion by Sept 2015. When all stages are complete, CPWL will supply a command area of 60,000 ha with 30,000 ha as ‘new irrigation’.
- BCI continues construction of the Lower Rakaia Barrhill scheme with potential to expand irrigable area by approximately 3,500 ha.
- MHIL has completed a number of scheme enhancement projects. A 6.1M m³ water storage facility at Carew has been constructed to improve reliability and reduce losses across their distribution network.
- Valetta Irrigation Limited (VIL) have completed scheme piping, which provides water under pressure and has increased their command areas from 7,300 to 13,200 ha; Ashburton Lyndhurst Irrigation Limited (ALIL) are currently converting to a piped network.

Partners include RDRML, Rangitata South Irrigation Ltd, Opuha Water Ltd, and Trustpower.

- RDRML’s proposed 15-60M m³ storage option at Klondyke could open up options to provide water into South Canterbury while also improving reliability in mid-Canterbury.
- Rangitata South scheme has completed construction to provide water to irrigate up to 16,000 ha.
- Environment Canterbury continues to work with South Canterbury interests to deliver reliable water.

Partners include: Ngāi Tahu Forest Estates (NTFE), Hurunui Water Project (HWP) and Amuri Irrigation Company (AIC).

- NTFE are considering infrastructure options to support their Balmoral Irrigation Project and conducting initial assessments of offline Hurunui River storage concepts
- HWP is partially consented and aims to supply water up to an additional 58,500 ha in the zone. HWP are progressing design investigations.
- AIC are actively considering scheme piping.

Waimakariri Irrigation Limited (WIL) is developing a proposal to store 8.2M m³ near the top of their scheme which will increase reliability (to up to 92%).

- Hunter Downs Irrigation (HDI) continues to work on feasibility and design options to irrigate up to 27,000 ha in South Canterbury.
- Waihao Downs Irrigation (WDI) has begun construction to pipe water from the Morven Glenavy, scheme to irrigate another 3,500 ha.

Partners include Trustpower, Central Plains Water Ltd (CPWL), Barrhill Chertsey Irrigation (BCI) and the Rangitata Diversion Race Management Ltd (RDRML).

- Approval of the variation to the Rakaia River Water Conservation Order has allowed Trustpower to store, schedule and distribute consented water from Lake Coleridge to improve irrigation reliability. With this in place, irrigation partners BCI and CPWL have secured long term storage and release agreements with Trustpower, which provide an opportunity to improve reliability and expand irrigated area in Selwyn-Waihora and Ashburton Zones.
- CPWL construction is underway with Stage 1, supplying water for 23,000 ha, due for completion by Sept 2015. When all stages are complete, CPWL will supply a command area of 60,000 ha with 30,000 ha as ‘new irrigation’.
- BCI continues construction of the Lower Rakaia Barrhill scheme with potential to expand irrigable area by approximately 3,500 ha.
- MHIL has completed a number of scheme enhancement projects. A 6.1M m³ water storage facility at Carew has been constructed to improve reliability and reduce losses across their distribution network.
- Valetta Irrigation Limited (VIL) have completed scheme piping, which provides water under pressure and has increased their command areas from 7,300 to 13,200 ha; Ashburton Lyndhurst Irrigation Limited (ALIL) are currently converting to a piped network.

Partners include RDRML, Rangitata South Irrigation Ltd, Opuha Water Ltd, and Trustpower.

- RDRML’s proposed 15-60M m³ storage option at Klondyke could open up options to provide water into South Canterbury while also improving reliability in mid-Canterbury.
- Rangitata South scheme has completed construction to provide water to irrigate up to 16,000 ha.
- Environment Canterbury continues to work with South Canterbury interests to deliver reliable water.
Chapter 9: Energy, Security and Efficiency

**GENERAL**

*New Zealand has set a target to generate 90% of its electricity from renewable energy sources by 2025. Canterbury’s water storage capacity can act as an enabler for other renewable generation technologies, such as wind, which rely on the generation from hydro storage being available on demand. Electricity generation is generally, but not always, a non-consumptive use, making it highly complementary to irrigation. Investigating hydro power options, particularly where they have additional benefits or dual use of the water (e.g. in combination with farm irrigation) is encouraged.*

**from 2010**

Maintain Canterbury’s existing contribution to New Zealand’s security of electricity supply.

**by 2015**

Started projects to generate electricity from existing irrigation infrastructure.

**by 2040**

Target 1: Generate at least 40-45% of the power used by irrigation in Canterbury from irrigation infrastructure (including multi-use hydro and irrigation systems) within Canterbury and other renewable on-farm sources.

Target 2: Maintain or increase Canterbury’s contribution to New Zealand’s security of electricity supply.

**INDICATORS**

- Electricity generation, in each zone, and for the region (2010 as baseline).
- Proportion of the electricity used by irrigation in Canterbury that is generated from Canterbury irrigation infrastructure and other renewable on-farm sources (2015 as baseline).

**Progress**

- Overall Canterbury continues to supply 54% of all hydro electricity generation while providing a 26% baseline component of the national electricity supply.
- Since 2010, ten of the major irrigation schemes across Canterbury have engaged in scheme upgrading. Seven have investigated options for hydro-electric power generation as part of their upgrade projects. None have been developed beyond the feasibility stage. Opportunities have not been developed because the economics are poor due to low utilisation of the generation kit, (seasonality). The current market economics for power generation are not suitable for the level of investment required.
**EFFICIENCY**

*New infrastructure options must include consideration for hydro-electric power generation and where possible, feature design that utilises the landscape to convey water under pressure. This can minimise the need for pumping and as a result can improve energy efficiency. Some existing schemes are upgrading their infrastructure by replacing open channels with piped networks or substituting groundwater for newly available surface water.*

**Progress**

» As new irrigation scheme options are considered and developed, opportunities for multiple use are being included in the feasibility and design phases of development either through piping. Piped water under pressure reduces the need for on-farm pumping. Three major projects have been completed in mid-Canterbury since 2010:
  » 88km of the Valetta Irrigation Scheme was completed in September 2012 with the aim to improve reliability, reduce conveyance losses and increase the area of land able to be irrigated by delivering water under pressure therefore reducing power consumption,
  » The Mayfield Hinds Irrigation Limited (MHIL) is also investigating pressure piping opportunities to provide for an additional 5,500 ha of irrigation and to reduce power use as part of their scheme upgrade, which has recently included additional storage for 6.1 M m³ at Carew,
  » Ashburton Lyndhurst Irrigation Limited (ALIL) scheme has completed piping of 3,500 ha both improve reliability, reduce on-farm pumping costs and conserve water loss from open channels. ALIL Plans to complete this project to cover 30,000 ha by 2017.

» Power savings can also be realised by substituting deep groundwater for newly available surface water.

» Central Plains Water has consents to provide water for 60,000 ha of land. Only 30,000ha of this will be new irrigation as the scheme is designed to provide water to 30,000 ha of existing irrigators who will be able to reduce power consumption by replacing their deep water takes with scheme available water.
Most economic reporting recognises the importance of water to regional economic growth through its impact on agriculture. Indicators for Regional Gross Domestic Product (GDP) and employment growth are readily available, regularly updated and show positive trends. However, direct measures of the ‘value added’ impact of water on the regional economy are not yet readily available.

**GENERAL**

Despite the 2010-11 earthquakes, the regional economy expanded more than any other region (30.9%) between 2009 and 2014, compared with 22.4% growth over the same period for New Zealand as a whole (see figure 9.1)

In 2014, Canterbury had the second-largest GDP increase by region (10.6%). New Zealand’s total GDP increase was 6.7%.

Increased Canterbury’s contribution to national GDP from 15% to 20%, of which 2% is attributable to increased production and better water management.

A demonstrable increase in economic wealth due to biodiversity protection and improvement, and increased recreational use of water resulting from implementation of the Canterbury Water Management Strategy.

**INDICATORS**

- Dollar per annum per unit of water “value added” (used in production of crops, electricity, or commercial uses).
- Employment per unit of water used in production of crops, electricity, or commercial uses.
EXTERNALITIES AND OPPORTUNITY COSTS

from 2010
Any assessments of regional economic value factor in externalities (e.g., water quality treatment costs, climate change emissions, changed recreational values) as well as the costs of environmental repair and restorations.

by 2020
Measures in place to assess the economic wealth benefits of freshwater biodiversity (and other ecosystem services) and recreational use of water.

by 2040
Recognised and reported on the employment benefits (direct and indirect) that arose from the Canterbury Water Management Strategy.

INDICATORS
Actions undertaken to include and report on externalities, restoration costs and employment benefits in economic impact calculations.

Progress
- No assessments of regional economic value at a regional scale have been commissioned which factor in externalities.